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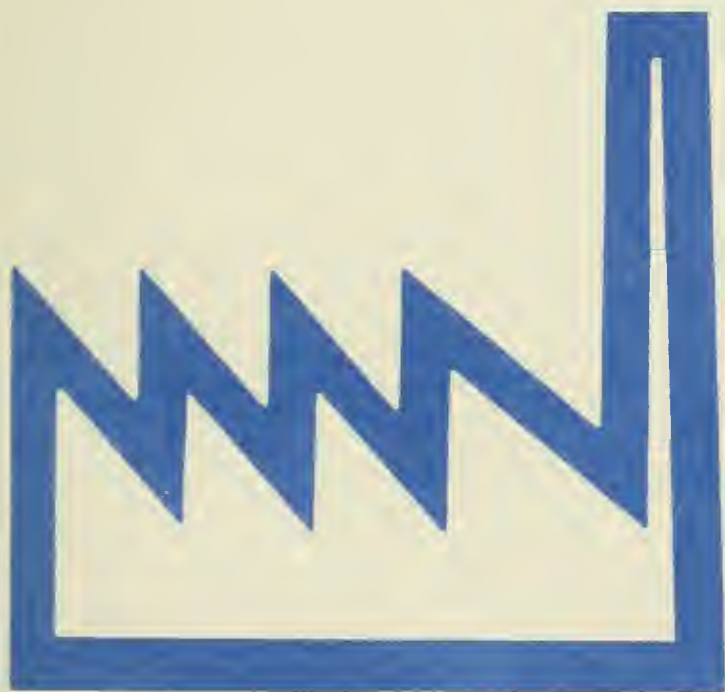
Census of Manufactures

MC87-I-38A

INDUSTRY SERIES

Search and Navigation Equipment and Engineering, Measuring, Controlling, and Optical Instruments

Industries 3812, 3821, 3822, 3823, 3824, 3825, 3826, 3827,
and 3829



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Many persons participated in the various activities of the 1987 Census of Manufactures.

The overall planning and review of the census operations were performed by the staff of the Office of the Assistant Director for Economic and Agriculture Censuses.

This report was prepared in the Industry Division. **John Govoni**, Assistant Chief for Census/ASM Programs, was responsible for the overall planning, management, and coordination of the census of manufactures. Planning and implementation were under the direction of **Kenneth I. Hansen**, Chief, Census/ASM Durables Branch, assisted by **Charles T. Lee, Jr.**, Section Chief, with primary data analysis responsibilities performed by **Gretchen Dickson**.

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If you have any questions concerning the statistics in this report, call (301) 763-7304.

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and 3829

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INTRODUCTION

PURPOSE AND CLASS OF THE ECONOMIC CENSUSES

The economic censuses are the main source of facts about the economic structure of the Italian economy. They provide information of paramount importance for government, business, industry, and the general public.

Through economic censuses an important part of the information on the economic measures, as the gross value added, the gross regional measures, production, turnover, exports, and other statistical series, can be obtained in a complete and accurate manner.

The economic censuses are organized by the General Government and the Statistical Office of the Italian Republic.

The economic censuses are the data to which the business community can refer to check their own performance, to compare it with the business of other companies.

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AUTHORITY AND SCOPE

The economic censuses are organized by the General Government and the Statistical Office of the Italian Republic.

- Census of Fixed Trade
- Census of Wholesale Trade
- Census of Service Industries
- Census of Transportation
- Census of Manufacturing
- Census of Retail Trade
- Census of Construction Industries

MANUFACTURE AND INDUSTRY SERIES

The economic censuses are organized by the General Government and the Statistical Office of the Italian Republic.

AVAILABILITY OF THE DATA

The results of each of the economic censuses are available in printed reports, for sale by the Statistical Office and the Printing Office, and on computer tapes, for sale by the Census Bureau. The results of the economic censuses are also available on computer tapes, for sale by the Census Bureau. The results of the economic censuses are also available on computer tapes, for sale by the Census Bureau.

Census facts are also widely available in the general press, in business journals, and in the statistical series containing census statistics. The results of the economic censuses are also available in the general press, in business journals, and in the statistical series containing census statistics.

WHAT'S NEW IN 1987

Several changes have taken place for the 1987 censuses. Data will be reported on the basis of the newly revised Standard Industrial Classification (SIC) system and selected reports including "bridge tables" linking the old and new classification systems. A new set of metropolitan areas has been adopted, and more detailed information will be available for businesses with no paid employees. For additional information on these changes, refer to the subsequent text.

HISTORICAL INFORMATION

The economic censuses have been taken together as an integrated program at 5-year intervals since 1967, and before that for 1963, 1958, and 1954. Prior to this time, the individual censuses were taken separately at varying intervals.

The economic censuses trace their beginnings to the 1910 Decennial Census, when a listing of economic activities was included with those for population. The scope of economic activities was expanded for 1940 and subsequent censuses to include mining and some commercial

CENSUS OF MANUFACTURES

General

This report, from the 1987 Census of Manufactures, is one of a series of 83 industry reports, each of which provides statistics for individual industries or groups of related industries. Additional separate reports will be issued for each State and the District of Columbia and for special subjects such as type of organization, distribution of sales by class of customer, concentration ratios and water use in manufacturing.

State reports present similar statistics for each State and its important metropolitan statistical areas (MSA's), counties, and places. Selected statistical totals for "all manufacturing" have been shown in the State reports for MSA's with 250 employees or more and for counties and places with 450 employees or more.

The *General Summary* report will contain industry, product class, and geographic area statistics summarized in one report. The introduction to the *General Summary* discusses, at greater length, many of the subjects described in this introduction. For example, the *General Summary* text will discuss the relationship of value added by manufacture to National income by industry of origin, the changes in statistical concepts over the history of the censuses, and the valuation problems arising from intracompany transfers between manufacturing plants of a company and between manufacturing plants and sales offices and sales branches of a company.

Scope of Census and Definition of Manufacturing

The 1987 Census of Manufactures covers all establishments with one paid employee or more primarily engaged in manufacturing as defined in the *1987 Standard Industrial*

Economic censuses have also been taken in Puerto Rico since 1909, in the Virgin Islands and Guam since 1958, and in the Northern Mariana Islands since 1982.

Statistical reports from the 1982 and earlier censuses provide historical figures for the study of long-term time series, and are available in some large libraries. All of the census data published since 1967 are still available for sale on microfiche from the Census Bureau.

AVAILABILITY OF MORE FREQUENT ECONOMIC DATA

While the censuses provide complete enumerations every 5 years, there are many needs for more frequent data as well. The Census Bureau conducts a number of monthly, quarterly, and annual surveys, the results of which appear in publication series such as *Current Business Reports* (retail and wholesale trade and service industries), the *Annual Survey of Manufactures*, *Current Industrial Reports*, and the *Quarterly Financial Report*. Most of these surveys, while providing more frequent

information (including name, address, kind of business, or other data for individual business establishments or companies) as are the regular publications.

Special tabulations are prepared on a cost basis. A request for a cost estimate, as well as exact specifications on the type and format of the data to be provided, should be directed to the Chief, Industry Division, Bureau of the Census, Washington, DC 20233.

ABBREVIATIONS AND SYMBOLS

The following abbreviations and symbols are used in this publication:

–	Represents zero.
(D)	Withheld to avoid disclosing data for individual companies; data are included in higher level totals.
(NA)	Not available.
(NC)	Not comparable.
(S)	Withheld because estimate did not meet publication standards.
(X)	Not applicable.
(Z)	Less than half the unit shown.
do	Ditto.

n.e.c.	Not elsewhere classified.
n.s.k.	Not specified by kind.
pt.	Part.
r	Revised.
SIC	Standard Industrial Classification.

Other abbreviations, such as lb, gal, yd, doz, bbl, and s tons, are used in the customary sense.

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Import/Export Publications	Foreign Trade Division	(301) 763-5140
Industry Analysis and Forecasts	International Trade Administration	(202) 377-4356

Users' Guide for Locating Statistics in This Report by Table Number

For explanation of terms, see appendixes

Item	Four-digit industry statistics							Five-digit product class and seven-digit product statistics			
	Historical	Operating ratios	By geographic area	Summary and supplemental	By employment size	By industry and product class specialization	Materials consumed by kind	Industry-product analysis	Product shipments	Product class by geographic area	Historical product class
Number of companies	1a			3a					*6a		
Number of establishments	1a		2	3a	4	5a					
Employment and payroll:											
Number of employees	1a	1b	2	3a	4	5a					
Payroll	1a	1b	2	3a	4	5a					
Supplemental labor costs				3a							
Production workers	1a	1b	2	3a	4	5a					
Production- worker hours	1a	1b	2	3a	4	5a					
Production- worker wages	1a	1b	2	3a	4	5a					
Shipments, cost of materials, and value added:											
Value of shipments (four-digit)	1a	1b	2	3a	4	5a		5b			
Product class shipments (five-digits)									6a	6b	6c
Product shipments (seven-digit)									6a		
Value added by manufacture	1a	1b	2	3a	4	5a					
Cost of materials	1a	1b	2	3a	4	5a					
Fuels and electric energy				3a							
Materials consumed by kind							7				
Inventories:											
Total, end of year	1a			3a	4						
By stage of fabrication				3a							
Capital expenditures, assets, rental payments, and purchased services:											
New capital expenditures	1a		2	3b	4	5a					
Used plant and equipment expenditures				3b							
Gross assets				3b							
Depreciation				3b							
Retirements of buildings and machinery				3b							
Rental payments				3b							
Foreign content of materials consumed				3c							
Purchased services				3c							
Ratios:											
Specialization	1a			3a				5b			
Coverage	1a			3a				5b			

*Number of companies with shipments of more than \$100 thousand.

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Search and Navigation Equipment and Engineering, Measuring, Controlling, and Optical Instruments

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DESCRIPTION OF INDUSTRIES AND SUMMARY OF FINDINGS

This report shows 1987 Census of Manufactures statistics for establishments classified in each of the following industries:

SIC code and title

3812	Search and Navigation Equipment
3821	Laboratory Apparatus and Furniture
3822	Environmental Controls
3823	Process Control Instruments
3824	Fluid Meters and Counting Devices
3825	Instruments To Measure Electricity
3826	Analytical Instruments
3827	Optical Instruments and Lenses
3829	Measuring and Controlling Devices, N.E.C.

The industry statistics (employment, payroll, cost of materials, value of shipments, inventories, etc.) are reported for each establishment as a whole. Aggregates of such data for an industry reflect not only the primary activities of the establishments but also their activities in the manufacture of secondary products as well as their miscellaneous activities (contract work on materials owned by others, repair work, etc.). This fact should be taken into account when comparing industry statistics (tables 1 through 5a) with product statistics (table 6) showing shipments by all industries of the primary products of the specified industry. The extent of the "product mix" is indicated in table 5b, which shows the value of primary and secondary products shipped by establishments classified in the specified industry and the value of primary products of the industry shipped as secondary products by establishments classified in other industries.

Small single-establishment companies with up to 20 employees (cutoff varied by industry) were excluded from the mail portion of the census. For these establishments (and a small number of larger establishments whose reports were not received at the time the data were tabulated), data on payrolls and receipts were obtained from administrative records of other Federal agencies. The remaining statistics were developed from industry averages.

Establishment data were tabulated based on industry definitions included in the 1987 Standard Industrial Classification (SIC) Manual¹. The 1987 edition represents a major revision for manufacturing industries from the 1972

edition and its 1977 supplement. In addition to the 1987 SIC revision, changes were made to the product class (five-digit) and product code (seven-digit) categories. The product class and product code comparability between the 1987 and 1982 censuses is shown in the appendixes. These appendixes present, in tabular form, the linkage from 1987 to 1982.

All dollar figures included in this report are at prices current for the year specified and, therefore, unadjusted for changes in price levels. Consequently, when making comparisons to prior years, users should take into consideration the inflation that has occurred.

INDUSTRY 3812, SEARCH AND NAVIGATION EQUIPMENT

This industry is made up of establishments primarily engaged in manufacturing search, detection, navigation, guidance, aeronautical, and nautical systems and instruments. Important products of this industry are radar systems and equipment; sonar systems and equipment; navigation systems and equipment; countermeasures equipment; aircraft and missile control systems and equipment; flight and navigation sensors, transmitters, and displays; gyroscopes; airframe equipment instruments; and speed, pitch, and roll navigational instruments and systems. Establishments primarily engaged in manufacturing aircraft engine instruments or meteorological systems and equipment, including weather tracking equipment, are classified in industry 3829. Products of this industry also are collected in the Current Industrial Reports MA-38B, Selected Instruments and Related Products, and MA-36P, Communication Equipment.

Industry 3812, Search and Navigation Equipment, is a combination of part of 1972 SIC-based Industries 3811, Engineering and Scientific Instruments, and 3662, Radio and Television Communication Equipment. See report MC87-I-36D for statistics on old industry 3662. The effect of the revisions on the data is summarized in tables 1c-1 and 1c-2. During the 1987 processing, each establishment was classified according to both the old and new SIC. Table 1c-1 shows the distribution of the new industry among the old SIC classifications. Table 1c-2 shows the distribution of the old SIC-based industries among the new SIC classifications.

In the 1987 Census of Manufactures, Industry 3812, Search and Navigation Equipment, had employment of 369.4 thousand. The leading States in employment in 1987 were California, New York, Texas, and Florida, accounting for 53 percent of the industry's employment.

¹Standard Industrial Classification Manual: 1987. For sale by Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402. Stock No. 041-001-00314-2.

The total value of shipments for establishments classified in this industry was \$36.3 billion.

Establishments in virtually all industries ship secondary products as well as products primary to the industry to which they are classified and have some miscellaneous receipts, such as resales and contract receipts. Industry 3812 shipped \$30.6 billion of search and navigation equipment products considered primary to the industry, \$3.9 billion of secondary products, and had \$1.7 billion of miscellaneous receipts, resales, and contract work. Thus, the ratio of primary products to the total of both secondary and primary products shipped by establishments in the industry was 89 percent (specialization ratio).

Establishments in this industry also accounted for 90 percent of products considered primary to the industry no matter where they actually were produced (coverage ratio). The products primary to industry 3812, no matter in what industry they were produced, appear in table 6a and aggregate to \$34.0 billion. For further explanation of specialization and coverage ratios, see table 5b and the appendixes.

The total cost of materials, services, and fuels and electric energy used by establishments classified in the search and navigation equipment industry amounted to \$12.2 billion. Data on specific materials consumed appear in table 7.

Single-establishment companies in this industry with up to 10 employees were excluded from the mail portion of the census. The data for these establishments (and a small number of larger establishments whose reports were not received at the time the data were tabulated) were obtained from administrative records of other agencies or developed from industry averages. These establishments accounted for 4 percent of total value of shipments.

INDUSTRY 3821, LABORATORY APPARATUS AND FURNITURE

This industry is made up of establishments primarily engaged in manufacturing laboratory apparatus and furniture. Important products of this industry include laboratory balances and scales, laboratory furnaces and ovens, laboratory centrifuges, and various components, parts, and accessories for laboratory apparatus. Laboratory instruments are classified elsewhere, generally in other industries of industry group 382. Products of this industry also are collected in the Current Industrial Report MA-38B, Selected Instruments and Related Products.

Industry 3821, Laboratory Apparatus and Furniture, was previously included in the statistics for Industry 3811, Engineering and Scientific Instruments. The effect of the revisions on the data is summarized in tables 1c-1 and 1c-2. During the 1987 processing, each establishment was classified according to both the old and new SIC. Table 1c-1 shows the distribution of the new industry among the old SIC classifications. Table 1c-2 shows the distribution of the old SIC-based industries among the new SIC classifications.

In the 1987 Census of Manufactures, Industry 3821, Laboratory Apparatus and Furniture, had employment of 17.1 thousand. The leading States in employment in 1987 were California, New Jersey, Wisconsin, and Pennsylvania.

The total value of shipments for establishments classified in this industry was \$1.8 billion.

Establishments in virtually all industries ship secondary products as well as products primary to the industry to which they are classified and have some miscellaneous receipts, such as resales and contract receipts. Industry 3821 shipped \$1.5 billion of laboratory apparatus and furniture products considered primary to the industry, \$174.8 million of secondary products, and had \$111.6 million of miscellaneous receipts, resales, and contract work. Thus, the ratio of primary products to the total of both secondary and primary products shipped by establishments in the industry was 89 percent (specialization ratio).

Establishments in this industry also accounted for 92 percent of products considered primary to the industry no matter where they actually were produced (coverage ratio). The products primary to industry 3821, no matter in what industry they were produced, appear in table 6a and aggregate to \$1.6 billion. For further explanation of specialization and coverage ratios, see table 5b and the appendixes.

The total cost of materials, services, and fuels and electric energy used by establishments classified in the laboratory apparatus and furniture industry amounted to \$639.8 million. Data on specific materials consumed appear in table 7.

Single-establishment companies in this industry with up to 10 employees were excluded from the mail portion of the census. The data for these establishments (and a small number of larger establishments whose reports were not received at the time the data were tabulated) were obtained from administrative records of other agencies or developed from industry averages. These establishments accounted for 5 percent of total value of shipments.

INDUSTRY 3822, ENVIRONMENTAL CONTROLS

This industry is made up of establishments primarily engaged in manufacturing temperature and related controls for heating and air-conditioning installations and refrigeration applications, which are electrically, electronically, or pneumatically actuated, and which measure and control variables such as temperature and humidity; and automatic regulators used as components of household appliances. Establishments primarily engaged in manufacturing industrial process controls are classified in industry 3823; those manufacturing motor control switches are classified in industry 3625; those manufacturing switches for household appliances are classified in industry 3643; and those manufacturing appliance timers are classified in industry 3873. Products of this industry also are collected in the Current Industrial Report MA-38B, Selected Instruments and Related Products.

The 1987 definition of this industry is the same as that used in the 1972/7 Standard Industrial Classification (SIC) system. The SIC number and title also are the same.

In the 1987 Census of Manufactures, Industry 3822, Environmental Controls, had employment of 26.5 thousand. The employment figure was 8 percent below the 28.8 thousand reported in 1982. The leading States in employment in 1987 were California, Illinois, Minnesota, and Ohio. These same States were the leaders in 1982.

The total value of shipments for establishments classified in this industry was \$2.1 billion.

Establishments in virtually all industries ship secondary products as well as products primary to the industry to which they are classified and have some miscellaneous receipts, such as resales and contract receipts. Industry 3822 shipped \$1.8 billion of environmental controls products considered primary to the industry, \$147.5 million of secondary products, and had \$124.5 million of miscellaneous receipts, resales, and contract work. Thus, the ratio of primary products to the total of both secondary and primary products shipped by establishments in the industry was 92 percent (specialization ratio). In 1982, the specialization ratio also was 92 percent.

Establishments in this industry also accounted for 89 percent of products considered primary to the industry no matter where they actually were produced (coverage ratio). In 1982, the coverage ratio was 90 percent. The products primary to industry 3822, no matter in what industry they were produced, appear in table 6a and aggregate to \$2.0 billion. For further explanation of specialization and coverage ratios, see table 5b and the appendixes.

The total cost of materials, services, and fuels and electric energy used by establishments classified in the environmental controls industry amounted to \$759.9 million. Data on specific materials consumed appear in table 7.

Single-establishment companies in this industry with up to 20 employees were excluded from the mail portion of the census. The data for these establishments (and a small number of larger establishments whose reports were not received at the time the data were tabulated) were obtained from administrative records of other agencies or developed from industry averages. These establishments accounted for 6 percent of total value of shipments.

INDUSTRY 3823, PROCESS CONTROL INSTRUMENTS

This industry is made up of establishments primarily engaged in manufacturing industrial instruments and related products for measuring, displaying (indicating and/or recording), transmitting, and controlling process variables in manufacturing, energy conversion, and public service utilities. These instruments operate mechanically, pneumatically, electronically, or electrically to measure process variables, such as temperature, humidity, pressure, vacuum, combustion, flow, level, viscosity, density, acidity,

alkalinity, specific gravity, gas and liquid concentration, sequence, time interval, mechanical motion, and rotation. Establishments primarily engaged in manufacturing electrical integrating meters are classified in industry 3825; those manufacturing residential and commercial comfort controls are classified in industry 3822; those manufacturing all liquid-in-glass and bimetal thermometers and glass hydrometers are classified in industry 3829; those manufacturing recorder charts are classified in industry group 275; and those manufacturing analytical and optical instruments are classified in industries 3826 and 3827.

The 1987 definition of this industry is the same as that used in the 1972/7 Standard Industrial Classification (SIC) system. The SIC number and title also are the same.

In the 1987 Census of Manufactures, Industry 3823, Process Control Instruments, had employment of 53.4 thousand. The employment figure was 11 percent below the 60.3 thousand reported in 1982. The leading States in employment in 1987 were Pennsylvania, California, Massachusetts, and Illinois, accounting for 46 percent of the industry's employment. This represents a shift from 1982 when Pennsylvania, California, Massachusetts, and New York accounted for 53 percent of the industry's employment.

The total value of shipments for establishments classified in this industry was \$4.8 billion.

Establishments in virtually all industries ship secondary products as well as products primary to the industry to which they are classified and have some miscellaneous receipts, such as resales and contract receipts. Industry 3823 shipped \$4.0 billion of process control instruments products considered primary to the industry, \$367.1 million of secondary products, and had \$382.6 million of miscellaneous receipts, resales, and contract work. Thus, the ratio of primary products to the total of both secondary and primary products shipped by establishments in the industry was 92 percent (specialization ratio). In 1982, the specialization ratio was 91 percent.

Establishments in this industry also accounted for 92 percent of products considered primary to the industry no matter where they actually were produced (coverage ratio). In 1982, the coverage ratio was 87 percent. The products primary to industry 3823, no matter in what industry they were produced, appear in table 6a and aggregate to \$4.4 billion. For further explanation of specialization and coverage ratios, see table 5b and the appendixes.

The total cost of materials, services, and fuels and electric energy used by establishments classified in the process control instruments industry amounted to \$1.6 billion. Data on specific materials consumed appear in table 7.

Single-establishment companies in this industry with up to 20 employees were excluded from the mail portion of the census. The data for these establishments (and a small number of larger establishments whose reports were not received at the time the data were tabulated) were obtained from administrative records of other agencies or

developed from industry averages. These establishments accounted for 10 percent of total value of shipments.

INDUSTRY 3824, FLUID METERS AND COUNTING DEVICES

This industry is made up of establishments primarily engaged in manufacturing totalizing (registering) meters monitoring fluid flows, such as watermeters and gasmeters; and producers of mechanical and electromechanical counters and associated metering devices. Establishments primarily engaged in electricity integrating meters and electronic frequency counters are classified in industry 3825, and those manufacturing industrial process instruments are classified in industry 3823. Products of this industry also are collected in the Current Industrial Report MA-38B, Selected Instruments and Related Products.

The 1987 definition of this industry is the same as that used in the 1972/7 Standard Industrial Classification (SIC) system. The SIC number and title also are the same.

In the 1987 Census of Manufactures, Industry 3824, Fluid Meters and Counting Devices, had employment of 10.1 thousand. The employment figure was 9 percent below the 11.1 thousand reported in 1982. The leading States in employment in 1987 were Pennsylvania, Connecticut, Wisconsin, and North Carolina. This represents a shift from 1982 when Pennsylvania, Connecticut, Wisconsin, and California were the leading States in employment.

The total value of shipments for establishments classified in this industry was \$938.6 million.

Establishments in virtually all industries ship secondary products as well as products primary to the industry to which they are classified and have some miscellaneous receipts, such as resales and contract receipts. Industry 3824 shipped \$861.7 million of fluid meters and counting devices products considered primary to the industry, \$46.7 million of secondary products, and had \$30.3 million of miscellaneous receipts, resales, and contract work. Thus, the ratio of primary products to the total of both secondary and primary products shipped by establishments in the industry was 95 percent (specialization ratio). In 1982, the specialization ratio was 94 percent.

Establishments in this industry also accounted for 76 percent of products considered primary to the industry no matter where they actually were produced (coverage ratio). In 1982, the coverage ratio was 84 percent. The products primary to industry 3824, no matter in what industry they were produced, appear in table 6a and aggregate to \$1.1 billion. For further explanation of specialization and coverage ratios, see table 5b and the appendixes.

The total cost of materials, services, and fuels and electric energy used by establishments classified in the fluid meters and counting devices industry amounted to \$381.2 million. Data on specific materials consumed appear in table 7.

Single-establishment companies in this industry with up to 20 employees were excluded from the mail portion of the census. The data for these establishments (and a

small number of larger establishments whose reports were not received at the time the data were tabulated) were obtained from administrative records of other agencies or developed from industry averages. These establishments accounted for 6 percent of total value of shipments.

INDUSTRY 3825, INSTRUMENTS TO MEASURE ELECTRICITY

This industry is made up of establishments primarily engaged in manufacturing instruments for measuring the characteristics of electricity and electrical signals, such as voltmeters, ammeters, wattmeters, watt-hour meters, demand meters, and equipment for testing the electrical characteristics of electrical, radio, and communication circuits and of internal combustion engines. Establishments primarily engaged in the manufacturing of electronic checkout, monitoring, evaluating, and other electronic support equipment for electronic navigational, radar, and sonar systems are classified in industry 3812, and those manufacturing similar equipment for communications systems classified in industry group 366. Products of this industry also are collected in the Current Industrial Report MA-38B, Selected Instruments and Related Products.

The 1987 definition of this industry is the same as that used in the 1972/7 Standard Industrial Classification (SIC) system. The SIC number and title also are the same.

In the 1987 Census of Manufactures, Industry 3825, Instruments To Measure Electricity, had employment of 85.2 thousand. The employment figure was 5 percent below the 89.7 thousand reported in 1982. The leading States in employment in 1987 were California, Oregon, New York, and Massachusetts. This represents a shift from 1982 when California, Oregon, Massachusetts, and Colorado were the leading States in employment.

The total value of shipments for establishments classified in this industry was \$7.7 billion.

Establishments in virtually all industries ship secondary products as well as products primary to the industry to which they are classified and have some miscellaneous receipts, such as resales and contract receipts. Industry 3825 shipped \$7.0 billion of instruments to measure electricity products considered primary to the industry, \$345.6 million of secondary products, and had \$384.8 million of miscellaneous receipts, resales, and contract work. Thus, the ratio of primary products to the total of both secondary and primary products shipped by establishments in the industry was 95 percent (specialization ratio). In 1982, the specialization ratio was 94 percent.

Establishments in this industry also accounted for 92 percent of products considered primary to the industry no matter where they actually were produced (coverage ratio). In 1982, the coverage ratio was 91 percent. The products primary to industry 3825, no matter in what industry they were produced, appear in table 6a and aggregate to \$7.6 billion. For further explanation of specialization and coverage ratios, see table 5b and the appendixes.

The total cost of materials, services, and fuels and electric energy used by establishments classified in the instruments to measure electricity industry amounted to \$2.7 billion. Data on specific materials consumed appear in table 7.

Single-establishment companies in this industry with up to 20 employees were excluded from the mail portion of the census. The data for these establishments (and a small number of larger establishments whose reports were not received at the time the data were tabulated) were obtained from administrative records of other agencies or developed from industry averages. These establishments accounted for 8 percent of total value of shipments.

INDUSTRY 3826, ANALYTICAL INSTRUMENTS

This industry is made up of establishments primarily engaged in manufacturing laboratory instruments and instrumentation systems for chemical or physical analysis of the composition or concentration of samples of solid, fluid, gaseous, or composite material. Establishments primarily engaged in manufacturing instruments for monitoring and analyzing continuous samples from medical patients are classified in industry 3845, and from industrial process streams are classified in industry 3823. Products of this industry also are collected in the Current Industrial Report MA-38B, Selected Instruments and Related Products.

Industry 3826, Analytical Instruments, is a combination of part of 1972 SIC-based industries 3811, Engineering and Scientific Instruments, and 3832, Optical Instruments and Lenses. The effect of the revisions on the data is summarized in tables 1c-1 and 1c-2. During the 1987 processing, each establishment was classified according to both the old and new SIC. Table 1c-1 shows the distribution of the new industry among the old SIC classifications. Table 1c-2 shows the distribution of the old SIC-based industries among the new SIC classifications.

In the 1987 Census of Manufactures, Industry 3826, Analytical Instruments, had employment of 31.2 thousand. The leading States in employment in 1987 were California, Florida, Massachusetts, and Texas.

The total value of shipments for establishments classified in this industry was \$3.5 billion.

Establishments in virtually all industries ship secondary products as well as products primary to the industry to which they are classified and have some miscellaneous receipts, such as resales and contract receipts. Industry 3826 shipped \$2.8 billion of analytical instruments products considered primary to the industry, \$441.5 million of secondary products, and had \$182.8 million of miscellaneous receipts, resales, and contract work. Thus, the ratio of primary products to the total of both secondary and primary products shipped by establishments in the industry was 87 percent (specialization ratio).

Establishments in this industry also accounted for 90 percent of products considered primary to the industry no matter where they actually were produced (coverage ratio).

The products primary to industry 3826, no matter in what industry they were produced, appear in table 6a and aggregate to \$3.2 billion. For further explanation of specialization and coverage ratios, see table 5b and the appendixes.

The total cost of materials, services, and fuels and electric energy used by establishments classified in the analytical instruments industry amounted to \$1.4 billion. Data on specific materials consumed appear in table 7.

Single-establishment companies in this industry with up to 5 employees were excluded from the mail portion of the census. The data for these establishments (and a small number of larger establishments whose reports were not received at the time the data were tabulated) were obtained from administrative records of other agencies or developed from industry averages. These establishments accounted for 11 percent of total value of shipments.

INDUSTRY 3827, OPTICAL INSTRUMENTS AND LENSES

This industry is made up of establishments primarily engaged in manufacturing instruments and apparatus that measure and optical property and optically project, measure, or magnify an image, such as binoculars, microscopes, prisms, and lenses. Included are establishments primarily engaged in manufacturing optical sighting and fire control equipment. Products of this industry also are collected in the Current Industrial Report MA-38B, Selected Instruments and Related Products.

Industry 3827, Optical Instruments and Lenses, was previously included in the statistics for Industry 3832, Optical Instruments and Lenses. The effect of the revisions on the data is summarized in tables 1c-1 and 1c-2. During the 1987 processing, each establishment was classified according to both the old and new SIC. Table 1c-1 shows the distribution of the new industry among the old SIC classifications. Table 1c-2 shows the distribution of the old SIC-based industries among the new SIC classifications.

In the 1987 Census of Manufactures, Industry 3827, Optical Instruments and Lenses, had employment of 20.1 thousand. The leading States in employment in 1987 were California, Massachusetts, New Hampshire, and Connecticut.

The total value of shipments for establishments classified in this industry was \$1.9 billion.

Establishments in virtually all industries ship secondary products as well as products primary to the industry to which they are classified and have some miscellaneous receipts, such as resales and contract receipts. Industry 3827 shipped \$1.6 billion of optical instruments and lenses products considered primary to the industry, \$161.7 million of secondary products, and had \$106.1 million of miscellaneous receipts, resales, and contract work. Thus, the ratio of primary products to the total of both secondary and primary products shipped by establishments in the industry was 91 percent (specialization ratio).

Establishments in this industry also accounted for 80 percent of products considered primary to the industry no matter where they actually were produced (coverage ratio). The products primary to industry 3827, no matter in what industry they were produced, appear in table 6a and aggregate to \$2.0 billion. For further explanation of specialization and coverage ratios, see table 5b and the appendixes.

The total cost of materials, services, and fuels and electric energy used by establishments classified in the optical instruments and lenses industry amounted to \$694.7 million. Data on specific materials consumed appear in table 7.

Single-establishment companies in this industry with up to 10 employees were excluded from the mail portion of the census. The data for these establishments (and a small number of larger establishments whose reports were not received at the time the data were tabulated) were obtained from administrative records of other agencies or developed from industry averages. These establishments accounted for 5 percent of total value of shipments.

INDUSTRY 3829, MEASURING AND CONTROLLING DEVICES, N.E.C.

This industry is made up of establishments primarily engaged in manufacturing measuring and controlling devices, not elsewhere classified, including meteorological instruments. Important products of this industry are physical properties testing equipment, nuclear radiation detection and monitoring instrumentation, aircraft engine instruments (except flight), and liquid-in-glass and bimetal thermometers. Also included in this industry are establishments primarily engaged in manufacturing surveying and drafting instruments, such as alidades, transits, sextants, theodolites, slide rules, and T-squares. Products of this industry also are collected in the Current Industrial Report MA-38B, Selected Instruments and Related Products.

The 1987 definition of this industry has been revised from that used in the 1972 Standard Industrial Classification (SIC) manual. However, the SIC number and title are unchanged. Industry 3829 is a combination of all of 1972 SIC-based industry 3829, Measuring and Controlling Devices, N.E.C., and part of 1972 SIC-based Industries 3662, Radio and Television Communication Equipment; 3811, Engineering and Scientific Instruments; and 3832, Optical Instruments and Lenses. The effect of the revisions of the data

is summarized in tables 1c-1 and 1c-2. During the 1987 processing, each establishment was classified according to both the old and new SIC. Table 1c-1 shows the distribution of the new industry among the old SIC classifications. Table 1c-2 shows the distribution of the old SIC-based industries among the new SIC classifications.

In the 1987 Census of Manufactures, Industry 3829, Measuring and Controlling Devices, N.E.C., had employment of 41.0 thousand. The leading States in employment in 1987 were California, Ohio, New York, and Massachusetts.

The total value of shipments for establishments classified in this industry was \$3.4 billion.

Establishments in virtually all industries ship secondary products as well as products primary to the industry to which they are classified and have some miscellaneous receipts, such as resales and contract receipts. Industry 3829 shipped \$2.7 billion of measuring and controlling devices, n.e.c., products considered primary to the industry, \$428.7 million of secondary products, and had 289.7 million of miscellaneous receipts, resales, and contract work. Thus, the ratio of primary products to the total of both secondary and primary products shipped by establishments in the industry was 86 percent (specialization ratio).

Establishments in this industry also accounted for 80 percent of products considered primary to the industry no matter where they actually were produced (coverage ratio). The products primary to industry 3829 no matter in what industry they were produced, appear in table 6a and aggregate to \$3.4 billion. For further explanation of specialization and coverage ratios, see table 5b and the appendixes.

The total cost of materials, services, and fuels and electric energy used by establishments classified in the measuring and controlling devices, n.e.c., industry amounted to \$1.2 billion. Data on specific materials consumed appear in table 7.

Single-establishment companies in this industry with up to 10 employees were excluded from the mail portion of the census. The data for these establishments (and a small number of larger establishments whose reports were not received at the time the data were tabulated) were obtained from administrative records of other agencies or developed from industry averages. These establishments accounted for 8 percent of total value of shipments.

Table 1a-1. Historical Statistics for the Industry (1987 Basis): 1987 and Earlier Years

[Industries with only 1987 data are revised for 1987. Table 1a-2 contains historical data on the old SIC basis. See table 1c-1 for composition of the new industry on the old SIC basis. Excludes data for auxiliaries. For meaning of abbreviations and symbols, see introductory text. For explanation of terms, see appendixes]

Year ¹	Companies ² (no.)	All establishments ³		All employees		Production workers			Value added by manufac- ture ⁴ (million dollars)	Cost of materials ⁵ (million dollars)	Value of shipments (million dollars)	New capital expend- itures ⁶ (million dollars)	End-of- year invent- ories ⁴ (million dollars)	Ratios		
		Total (no.)	With 20 employ- ees or more (no.)	Number (1,000)	Payroll (million dollars)	Number (1,000)	Hours (millions)	Wages (million dollars)						Spe- ciali- zation ⁷ (per- cent)	Cover- age ⁸ (per- cent)	
1987 Census ---	INDUSTRY 3812, SEARCH AND NAVIGATION EQUIPMENT ⁹															
	920	1 084	508	369.4	12 373.0	158.7	314.3	4 466.2	24 738.7	12 208.3	36 266.8	1 439.1	9 454.6	89	90	
	INDUSTRY 3821, LABORATORY APPARATUS AND FURNITURE ⁹															
1987 Census ---	246	260	124	17.1	440.9	9.6	19.2	195.2	1 142.4	639.8	1 769.3	52.3	398.3	89	92	
	INDUSTRY 3822, ENVIRONMENTAL CONTROLS															
	1987 Census --- 1986 ASM----- 1985 ASM----- 1984 ASM----- 1983 ASM-----	233 (NA) (NA) (NA) (NA)	254 (NA) (NA) (NA) (NA)	106 (NA) (NA) (NA) (NA)	26.5 25.8 27.1 28.2 27.9	602.4 575.6 580.9 574.2 539.5	18.6 18.5 19.5 20.9 20.4	36.2 35.7 36.9 38.5 38.1	357.3 350.3 355.9 359.0 332.1	1 302.7 1 278.2 1 318.2 1 303.6 1 130.5	759.9 687.3 669.8 684.2 616.6	2 068.8 1 990.4 1 989.3 1 966.1 1 745.2	66.3 49.8 63.6 57.9 67.7	374.0 335.4 366.5 377.0 363.6	92 (NA) (NA) (NA) (NA)	89 (NA) (NA) (NA) (NA)
1982 Census --- 1981 ASM----- 1980 ASM----- 1979 ASM----- 1978 ASM-----	221 (NA) (NA) (NA) (NA)	245 (NA) (NA) (NA) (NA)	89 (NA) (NA) (NA) (NA)	28.8 32.6 33.2 35.1 40.0	497.5 527.8 502.3 474.8 487.1	20.6 23.9 24.8 26.8 31.4	36.2 45.5 48.9 52.3 61.5	301.9 337.6 338.1 325.0 345.0	1 025.7 991.1 969.5 872.2 951.5	514.3 588.4 592.2 511.5 568.7	1 549.1 1 587.1 1 541.5 1 366.2 1 492.5	66.8 72.6 60.6 46.3 49.4	361.7 348.3 344.7 312.8 308.5	92 (NA) (NA) (NA) (NA)	90 (NA) (NA) (NA) (NA)	
1977 Census --- 1976 ASM----- 1975 ASM----- 1974 ASM----- 1973 ASM----- 1972 Census ---	182 (NA) (NA) (NA) (NA) (NA)	201 (NA) (NA) (NA) (NA)	91 (NA) (NA) (NA) (NA)	39.0 31.5 26.6 33.3 33.0 30.7	450.3 336.6 274.2 303.8 288.1 253.6	30.6 23.3 18.3 24.3 25.5 23.3	57.9 44.1 34.5 45.0 48.4 44.5	315.6 217.3 164.7 193.4 191.4 166.4	859.6 737.2 526.9 594.3 606.8 511.8	529.4 376.8 275.0 338.2 281.3 223.8	1 358.7 1 071.7 827.2 916.8 857.8 728.1	47.7 21.6 11.6 26.2 18.0 17.1	285.9 227.0 183.9 209.5 176.2 141.3	80 (NA) (NA) (NA) (NA)	92 (NA) (NA) (NA) (NA)	
1987 Census --- 1986 ASM----- 1985 ASM----- 1984 ASM----- 1983 ASM-----	INDUSTRY 3823, PROCESS CONTROL INSTRUMENTS															
	708 (NA) (NA) (NA) (NA)	785 (NA) (NA) (NA) (NA)	343 (NA) (NA) (NA) (NA)	53.4 52.2 55.3 57.4 55.5	1 476.5 1 350.8 1 383.4 1 353.0 1 213.3	26.7 26.2 28.3 30.3 26.9	53.3 51.5 55.3 59.7 51.6	560.1 530.9 554.5 555.0 472.6	3 205.2 2 924.4 3 046.2 3 017.6 2 611.4	1 601.4 1 575.4 1 590.0 1 352.3 1 113.3	4 788.9 4 535.4 4 609.6 4 307.9 3 781.5	129.3 148.0 149.9 131.3 101.6	1 094.2 1 082.4 1 170.1 1 151.7 1 031.8	92 (NA) (NA) (NA) (NA)	92 (NA) (NA) (NA) (NA)	
	1982 Census --- 1981 ASM----- 1980 ASM----- 1979 ASM----- 1978 ASM-----	586 (NA) (NA) (NA) (NA)	627 (NA) (NA) (NA) (NA)	290 (NA) (NA) (NA) (NA)	60.3 53.6 51.2 51.4 50.6	1 256.1 1 013.4 897.4 828.1 765.6	30.0 28.1 26.6 27.1 25.5	57.7 55.7 53.1 54.5 50.8	482.0 421.0 370.2 353.0 311.0	2 826.9 2 437.7 2 049.5 1 895.8 1 609.6	1 175.5 1 088.4 986.8 875.6 764.6	4 037.8 3 508.6 2 991.6 2 682.1 2 328.5	127.4 117.1 94.2 83.5 74.1	1 074.4 934.7 860.0 775.3 643.6	91 (NA) (NA) (NA) (NA)	87 (NA) (NA) (NA) (NA)
	1977 Census --- 1976 ASM----- 1975 ASM----- 1974 ASM----- 1973 ASM----- 1972 Census ---	382 (NA) (NA) (NA) (NA) (NA)	426 (NA) (NA) (NA) (NA)	207 (NA) (NA) (NA) (NA)	46.5 35.6 40.2 41.6 40.8 35.6	664.8 465.0 528.5 503.4 441.0 342.9	23.4 18.1 18.6 20.1 20.4 18.4	47.0 36.3 37.0 40.6 41.5 37.1	265.9 182.5 180.7 185.1 169.6 146.8	1 399.4 954.0 819.6 868.7 739.3 620.4	657.1 419.5 423.4 444.0 338.4 271.1	2 022.0 1 357.2 1 237.9 1 245.5 1 039.1 883.6	52.1 35.1 31.1 31.4 31.9 27.3	555.9 393.5 410.4 421.4 339.0 271.7	90 (NA) (NA) (NA) (NA)	80 (NA) (NA) (NA) (NA)
	1987 Census --- 1986 ASM ¹⁰ ----- 1985 ASM----- 1984 ASM----- 1983 ASM-----	INDUSTRY 3824, FLUID METERS AND COUNTING DEVICES														
		138 (NA) (NA) (NA) (NA)	158 (NA) (NA) (NA) (NA)	61 (NA) (NA) (NA) (NA)	10.1 10.4 10.4 10.9 9.8	237.1 237.3 236.6 230.9 189.7	6.5 6.2 6.2 6.5 6.2	12.7 12.7 11.8 12.2 11.8	119.9 113.8 117.4 119.5 103.9	566.5 548.3 554.7 529.5 422.9	381.2 298.1 310.2 298.2 259.3	938.6 858.6 865.3 810.9 692.4	34.9 29.0 41.0 26.3 18.0	177.4 158.8 171.6 184.5 154.6	95 (NA) (NA) (NA) (NA)	76 (NA) (NA) (NA) (NA)
1982 Census --- 1981 ASM----- 1980 ASM----- 1979 ASM----- 1978 ASM-----		133 (NA) (NA) (NA) (NA)	145 (NA) (NA) (NA) (NA)	70 (NA) (NA) (NA) (NA)	11.1 15.2 16.5 17.8 17.0	198.0 256.8 247.9 245.5 221.6	6.9 10.3 11.3 11.9 11.8	13.1 20.2 22.2 23.6 23.4	109.4 153.7 152.7 143.2 138.4	460.2 530.0 533.6 556.7 489.4	266.7 368.0 358.6 315.0 273.9	728.3 901.1 884.0 844.2 749.9	27.6 32.2 27.8 28.6 18.0	172.0 182.8 192.4 203.1 172.0	94 (NA) (NA) (NA) (NA)	84 (NA) (NA) (NA) (NA)
1977 Census --- 1976 ASM----- 1975 ASM----- 1974 ASM----- 1973 ASM----- 1972 Census ---		100 (NA) (NA) (NA) (NA) (NA)	111 (NA) (NA) (NA) (NA)	62 (NA) (NA) (NA) (NA)	15.9 13.8 13.4 13.2 9.7 8.8	197.6 161.5 143.9 126.0 85.3 76.8	11.2 9.5 9.2 9.4 6.6 5.9	22.5 18.3 17.9 18.8 13.5 11.7	118.0 93.5 82.4 75.0 49.5 43.1	429.0 352.1 297.0 272.4 196.6 180.9	231.3 187.3 162.9 168.3 129.1 108.1	650.4 531.7 475.0 431.5 322.7 296.2	19.9 12.8 12.7 13.2 9.6 7.0	148.8 129.4 119.9 110.7 83.7 65.2	80 (NA) (NA) (NA) (NA)	80 (NA) (NA) (NA) (NA)
1987 Census --- 1986 ASM----- 1985 ASM----- 1984 ASM----- 1983 ASM-----		INDUSTRY 3825, INSTRUMENTS TO MEASURE ELECTRICITY														
		862 (NA) (NA) (NA) (NA)	930 (NA) (NA) (NA) (NA)	412 (NA) (NA) (NA) (NA)	85.2 86.2 92.4 95.8 89.7	2 476.7 2 356.1 2 293.6 2 356.1 2 052.3	43.9 44.3 48.3 53.0 49.5	91.4 89.2 93.1 101.7 94.1	1 005.4 986.0 989.6 987.2 860.4	5 090.9 4 535.2 5 169.8 5 371.3 4 413.3	2 662.4 2 407.1 2 474.0 2 589.5 2 129.0	7 703.3 6 940.5 7 705.2 7 810.5 6 484.4	307.5 290.4 343.1 418.0 272.6	1 878.7 1 739.4 1 811.8 1 890.7 1 586.5	95 (NA) (NA) (NA) (NA)	92 (NA) (NA) (NA) (NA)
	1982 Census --- 1981 ASM----- 1980 ASM----- 1979 ASM----- 1978 ASM-----	676 (NA) (NA) (NA) (NA)	749 (NA) (NA) (NA) (NA)	352 (NA) (NA) (NA) (NA)	89.7 94.8 94.9 84.6 76.6	1 888.2 1 852.9 1 647.9 1 258.9 1 072.3	48.9 50.2 52.4 48.4 45.6	92.5 96.7 100.7 96.5 88.6	757.1 736.4 667.4 557.1 503.6	4 290.1 4 074.6 3 574.1 2 796.0 2 162.1	1 840.7 1 780.9 1 697.9 1 340.4 1 286.2	6 094.4 5 744.9 5 183.4 4 025.0 3 368.6	308.3 278.6 260.4 215.7 150.0	1 469.1 1 344.7 1 229.9 1 049.3 834.4	94 (NA) (NA) (NA) (NA)	91 (NA) (NA) (NA) (NA)
	1977 Census --- 1976 ASM----- 1975 ASM----- 1974 ASM----- 1973 ASM----- 1972 Census ---	621 (NA) (NA) (NA) (NA) (NA)	671 (NA) (NA) (NA) (NA)	279 (NA) (NA) (NA) (NA)	66.5 61.1 60.9 67.9 60.2 60.6	889.1 759.2 700.8 689.3 563.8 523.5	40.4 37.7 37.7 43.6 38.9 34.6	78.3 72.3 70.5 84.5 77.2 68.7	414.5 359.3 328.5 338.1 289.4 257.9	1 807.7 1 507.1 1 452.9 1 390.2 1 191.8 1 046.8	1 026.8 842.8 714.1 713.3 585.0 524.9	2 761.0 2 365.5 2 198.9 2 073.8 1 735.6 1 540.8	99.1 71.1 69.8 75.5 60.4 39.3	668.9 547.7 523.5 550.0 460.5 382.2	90 (NA) (NA) (NA) (NA)	89 (NA) (NA) (NA) (NA)

See footnotes at end of table.

Table 1a-1. Historical Statistics for the Industry (1987 Basis): 1987 and Earlier Years—Con.

[Industries with only 1987 data are revised for 1987. Table 1a-2 contains historical data on the old SIC basis. See table 1c-1 for composition of the new industry on the old SIC basis. Excludes data for auxiliaries. For meaning of abbreviations and symbols, see introductory text. For explanation of terms, see appendixes]

Year ¹	Companies ² (no.)	All establishments ³		All employees		Production workers			Value added by manufac- ture ⁴ (million dollars)	Cost of materials ⁵ (million dollars)	Value of shipments (million dollars)	New capital expend- itures ⁶ (million dollars)	End-of- year inven- tories ⁴ (million dollars)	Ratios	
		Total (no.)	With 20 employ- ees or more (no.)	Number (1,000)	Payroll (million dollars)	Number (1,000)	Hours (millions)	Wages (million dollars)						Spe- ciali- zation ⁷ (per- cent)	Cover- age ⁸ (per- cent)
1987 Census ---	INDUSTRY 3826, ANALYTICAL INSTRUMENTS ⁹														
	528	562	207	31.2	892.9	13.5	26.7	287.3	2 107.1	1 363.2	3 468.2	125.5	781.2	87	90
	INDUSTRY 3827, OPTICAL INSTRUMENTS AND LENSES ⁹														
1987 Census ---	236	250	127	20.1	581.6	11.3	21.9	260.8	1 167.8	694.7	1 863.6	83.3	610.2	91	80
	INDUSTRY 3829, MEASURING AND CONTROLLING DEVICES, N.E.C. ⁹														
1987 Census ---	939	971	304	41.0	1 098.8	20.2	39.8	413.9	2 259.0	1 228.1	3 442.0	104.0	928.0	86	80

¹In annual survey of manufactures (ASM) years, data are estimates based on a representative sample of establishments canvassed annually and may differ from results of a complete canvass of all establishments. ASM publication shows percentage standard errors. Unless otherwise noted, for data prior to 1972, see 1972 Census of Manufactures, vol. II, table 1a of the Industry chapter.

²For the Census, a company is defined as a business organization consisting of one establishment or more under common ownership or control.

³Includes establishments with payroll at any time during year.

⁴Beginning with the 1982 Census of Manufactures, all respondents were requested to report their inventories at (the lower of) cost or market prior to adjustment to LIFO cost. This is a change from prior Censuses and annual surveys of manufactures in which respondents were permitted to value their inventories using any generally accepted accounting method. Consequently, inventories and value added by manufacture are not comparable to prior-year data.

⁵Detailed data on materials consumed by type are shown in table 7.

⁶Detailed data on new machinery and equipment expenditures are provided in table 3c.

⁷Represents ratio of primary product shipments to total product shipments (primary and secondary, excluding miscellaneous receipts) for establishments classified in the industry.

⁸Represents ratio of primary products shipped by establishments classified in industry to total shipments of such products by all manufacturing establishments, wherever classified.

⁹Industry definition is new for 1987 Census of Manufactures. An explanation of the Standard Industrial Classifications revision appears in the Summary of Findings of this report.

¹⁰Data either have associated standard errors exceeding 15 percent or are not consistent with other census series and related data; thus these estimates may be of limited reliability.

Table 1a-2. Historical Statistics for the Industry (1972 Basis): 1987 and Earlier Years

[Table 1a-2 contains the historical data on the old SIC basis. See table 1c-1 for composition of the new industry on the old SIC basis. Excludes data for auxiliaries. For meaning of abbreviations and symbols, see introductory text. For explanation of terms, see appendixes]

Year	Companies (no.)	All establishments		All employees		Production workers			Value added by manufac- ture (million dollars)	Cost of materials (million dollars)	Value of shipments (million dollars)	New capital expend- itures (million dollars)	End-of- year inven- tories (million dollars)	Ratios	
		Total (no.)	With 20 employ- ees or more (no.)	Number (1,000)	Payroll (million dollars)	Number (1,000)	Hours (millions)	Wages (million dollars)						Spe- cial- ization (per- cent)	Cover- age (per- cent)
INDUSTRY 3811, ENGINEERING AND SCIENTIFIC INSTRUMENTS															
1987 Census ---	(NA)	621	260	42.0	1 119.3	24.8	49.8	552.6	2 590.0	1 415.6	3 973.3	130.7	1 028.5	(NA)	(NA)
1986 ASM -----	(NA)	(NA)	(NA)	45.7	1 117.0	30.2	57.8	622.2	2 469.2	1 470.1	3 920.9	186.3	1 041.8	(NA)	(NA)
1985 ASM -----	(NA)	(NA)	(NA)	46.7	1 074.1	28.9	53.9	545.2	2 581.0	1 480.5	3 933.9	187.0	1 023.9	(NA)	(NA)
1984 ASM -----	(NA)	(NA)	(NA)	40.6	934.8	24.2	46.6	462.7	2 314.9	1 203.2	3 394.1	114.7	925.2	(NA)	(NA)
1983 ASM -----	(NA)	(NA)	(NA)	41.8	936.0	24.5	47.3	449.0	2 162.6	993.5	3 136.7	110.6	810.4	(NA)	(NA)
1982 Census ---	738	771	272	42.8	869.1	25.9	49.8	439.9	2 101.1	974.2	3 046.2	102.8	821.9	82	78
1981 ASM -----	(NA)	(NA)	(NA)	43.5	816.6	27.7	54.4	428.7	1 943.3	948.6	2 864.7	115.3	689.5	(NA)	(NA)
1980 ASM -----	(NA)	(NA)	(NA)	44.7	781.9	28.0	57.3	401.2	1 821.3	903.7	2 667.6	108.6	675.9	(NA)	(NA)
1979 ASM -----	(NA)	(NA)	(NA)	42.2	662.0	26.8	53.2	336.5	1 573.9	778.0	2 290.2	79.7	576.0	(NA)	(NA)
1978 ASM -----	(NA)	(NA)	(NA)	46.2	662.8	27.6	54.2	327.1	1 517.8	790.9	2 244.9	64.0	576.4	(NA)	(NA)
1977 Census ---	740	786	279	42.3	584.4	24.7	48.7	280.7	1 287.2	681.4	1 926.7	57.4	470.1	85	79
1976 ASM -----	(NA)	(NA)	(NA)	43.5	575.7	25.4	51.3	262.7	1 223.8	636.7	1 846.8	44.4	449.9	(NA)	(NA)
1975 ASM -----	(NA)	(NA)	(NA)	46.4	561.4	26.8	54.0	261.1	1 112.1	609.0	1 780.4	40.1	434.6	(NA)	(NA)
1974 ASM -----	(NA)	(NA)	(NA)	46.4	520.6	28.1	55.1	249.2	1 056.5	578.5	1 587.6	41.0	477.6	(NA)	(NA)
1973 ASM -----	(NA)	(NA)	(NA)	41.3	429.5	25.0	48.4	211.3	818.1	456.2	1 243.8	28.3	336.1	(NA)	(NA)
1972 Census ---	703	743	266	36.7	358.8	22.2	43.2	183.1	653.2	361.6	1 023.4	18.8	256.5	88	72
INDUSTRY 3829, MEASURING AND CONTROLLING DEVICES, N.E.C.															
1987 Census ---	(NA)	857	248	33.0	876.7	16.2	31.8	327.2	1 774.6	983.9	2 720.7	79.0	724.0	(NA)	(NA)
1986 ASM -----	(NA)	(NA)	(NA)	32.6	845.5	17.3	35.2	339.1	1 640.4	965.7	2 618.0	78.7	660.9	(NA)	(NA)
1985 ASM -----	(NA)	(NA)	(NA)	31.9	770.1	17.9	34.7	332.7	1 532.7	831.0	2 310.5	85.8	668.2	(NA)	(NA)
1984 ASM -----	(NA)	(NA)	(NA)	35.0	849.3	18.1	35.5	328.9	1 396.9	898.5	2 282.5	93.5	658.0	(NA)	(NA)
1983 ASM -----	(NA)	(NA)	(NA)	39.7	938.8	17.4	33.6	325.5	1 465.9	854.0	2 358.3	54.6	638.0	(NA)	(NA)
1982 Census ---	693	717	259	37.8	806.7	17.7	35.0	296.3	1 404.5	790.6	2 223.1	71.5	609.1	89	83
1981 ASM -----	(NA)	(NA)	(NA)	37.1	705.1	17.9	35.9	270.5	1 237.4	712.2	1 932.3	79.1	558.4	(NA)	(NA)
1980 ASM -----	(NA)	(NA)	(NA)	35.9	651.8	17.5	35.2	237.9	1 001.1	746.3	1 726.8	70.9	458.6	(NA)	(NA)
1979 ASM -----	(NA)	(NA)	(NA)	34.8	588.6	17.5	34.9	215.5	927.3	556.7	1 426.8	64.3	421.7	(NA)	(NA)
1978 ASM -----	(NA)	(NA)	(NA)	35.6	544.1	17.8	34.4	208.9	865.4	496.5	1 369.4	48.6	336.8	(NA)	(NA)
1977 Census ---	649	670	210	32.3	464.0	15.8	31.8	174.5	746.6	405.8	1 118.1	49.3	320.0	89	83
1976 ASM -----	(NA)	(NA)	(NA)	26.9	377.8	13.1	26.8	131.9	551.1	316.4	854.1	19.5	247.6	(NA)	(NA)
1975 ASM -----	(NA)	(NA)	(NA)	21.6	250.8	12.3	24.5	108.3	521.3	274.2	808.5	16.3	209.4	(NA)	(NA)
1974 ASM -----	(NA)	(NA)	(NA)	23.7	250.6	14.4	29.5	121.2	520.6	292.9	789.8	26.4	235.7	(NA)	(NA)
1973 ASM -----	(NA)	(NA)	(NA)	24.6	253.1	15.4	30.1	127.8	511.8	227.3	722.3	32.4	191.5	(NA)	(NA)
1972 Census ---	579	595	153	24.6	256.7	12.4	26.6	108.0	394.9	213.3	601.4	14.7	164.9	86	77

See footnotes at end of table.

Table 1a-2. Historical Statistics for the Industry (1972 Basis): 1987 and Earlier Years—Con.

[Table 1a-2 contains the historical data on the old SIC basis. See table 1c-1 for composition of the new industry on the old SIC basis. Excludes data for auxiliaries. For meaning of abbreviations and symbols, see introductory text. For explanation of terms, see appendixes]

Year	Companies (no.)	All establishments		All employees		Production workers			Value added by manufac- ture (million dollars)	Cost of materials (million dollars)	Value of shipments (million dollars)	New capital expend- itures (million dollars)	End-of- year invent- ories (million dollars)	Ratios	
		Total (no.)	With 20 employ- ees or more (no.)	Number (1,000)	Payroll (million dollars)	Number (1,000)	Hours (millions)	Wages (million dollars)						Spe- cial- ization (per- cent)	Cover- age (per- cent)
INDUSTRY 3832, OPTICAL INSTRUMENTS AND LENSES															
1987 Census ---	(NA)	774	336	51.1	1 470.7	24.7	48.4	546.0	3 266.7	2 053.1	5 318.9	208.2	1 388.4	(NA)	(NA)
1986 ASM -----	(NA)	(NA)	(NA)	49.8	1 383.2	25.6	48.8	535.8	3 077.6	1 948.9	4 951.7	171.7	1 321.8	(NA)	(NA)
1985 ASM -----	(NA)	(NA)	(NA)	53.2	1 336.5	26.8	51.5	498.4	3 160.3	1 853.9	4 946.9	206.6	1 256.7	(NA)	(NA)
1984 ASM -----	(NA)	(NA)	(NA)	52.5	1 280.8	26.0	51.9	471.9	3 135.8	1 667.5	4 767.8	205.9	1 125.5	(NA)	(NA)
1983 ASM -----	(NA)	(NA)	(NA)	51.0	1 158.8	24.7	48.5	446.4	2 692.1	1 501.9	4 129.5	159.7	1 047.8	(NA)	(NA)
1982 Census ---	574	638	294	50.0	1 025.5	25.5	50.3	427.9	2 368.2	1 420.0	3 757.3	150.8	987.3	88	86
1981 ASM -----	(NA)	(NA)	(NA)	43.2	783.1	23.8	46.4	350.4	1 982.1	1 168.5	3 101.9	126.8	761.2	(NA)	(NA)
1980 ASM -----	(NA)	(NA)	(NA)	43.5	785.6	22.8	44.2	298.7	1 839.8	977.0	2 744.0	118.2	662.2	(NA)	(NA)
1979 ASM -----	(NA)	(NA)	(NA)	39.8	658.6	21.1	42.4	268.7	1 517.3	799.5	2 224.3	93.7	543.5	(NA)	(NA)
1978 ASM -----	(NA)	(NA)	(NA)	34.3	534.9	18.1	36.6	214.7	1 226.3	636.2	1 802.3	69.6	446.4	(NA)	(NA)
1977 Census ---	509	546	200	30.2	423.5	17.1	34.0	189.7	901.8	456.1	1 335.6	51.2	303.3	84	82
1976 ASM -----	(NA)	(NA)	(NA)	26.3	348.8	14.6	28.9	150.1	695.2	338.2	1 028.5	24.7	244.2	(NA)	(NA)
1975 ASM -----	(NA)	(NA)	(NA)	22.7	282.8	12.9	24.3	122.0	571.8	280.8	859.5	23.9	200.2	(NA)	(NA)
1974 ASM -----	(NA)	(NA)	(NA)	20.1	237.8	11.8	23.2	108.8	499.4	252.2	744.4	15.3	162.9	(NA)	(NA)
1973 ASM -----	(NA)	(NA)	(NA)	18.5	201.1	10.9	21.0	89.2	385.5	193.9	594.5	13.6	142.4	(NA)	(NA)
1972 Census ---	467	494	146	18.8	193.3	10.4	20.6	85.1	384.3	175.4	538.4	12.7	156.2	92	79

Note: For qualifications of data, see footnotes on table 1a-1.

Table 1b-1. Selected Operating Ratios for the Industry (1987 Basis): 1987 and Earlier Years

[Industries with only 1987 data are revised for 1987. Table 1b-2 contains historical data on the old SIC basis. See table 1c-1 for composition of the new industry on the old SIC basis. Excludes data for auxiliaries. For meaning of abbreviations and symbols, see introductory text. For explanation of terms, see appendixes]

Year	Payroll per employee (dollars)	Production workers as percent of total employment (percent)	Annual hours of production workers (number)	Average hourly earnings of production workers (dollars)	Cost of materials as percent of value of shipments (percent)	Cost of materials and payroll as percent of value of shipments (percent)	Value added per employee (dollars)	Payroll as percent of value added (percent)	Value added per production worker hour (dollars)
INDUSTRY 3812, SEARCH AND NAVIGATION EQUIPMENT									
1987 Census -----	33 495	43	1 980	14.21	34	68	66 970	50	78.71
INDUSTRY 3821, LABORATORY APPARATUS AND FURNITURE									
1987 Census -----	25 784	56	2 000	10.17	36	61	66 807	39	59.50
INDUSTRY 3822, ENVIRONMENTAL CONTROLS									
1987 Census -----	22 732	70	1 946	9.87	37	66	49 158	46	35.99
1986 ASM -----	22 310	72	1 930	9.81	35	63	49 543	45	35.80
1985 ASM -----	21 435	72	1 892	9.64	34	63	48 642	44	35.72
1984 ASM -----	20 361	74	1 842	9.32	35	64	46 227	44	33.86
1983 ASM -----	19 336	73	1 868	8.72	35	66	40 520	48	29.67
1982 Census -----	17 274	72	1 757	8.34	33	65	35 615	49	28.33
1981 ASM -----	16 190	73	1 904	7.42	37	70	30 402	53	21.78
1980 ASM -----	15 129	75	1 972	6.91	38	71	29 202	52	19.83
1979 ASM -----	13 527	76	1 951	6.21	37	72	24 849	54	16.68
1978 ASM -----	12 177	79	1 959	5.61	38	71	23 788	51	15.47
1977 Census -----	11 546	78	1 892	5.45	39	72	22 041	52	14.85
1976 ASM -----	10 685	74	1 893	4.93	35	67	23 403	46	16.72
1975 ASM -----	10 308	69	1 885	4.77	33	66	19 808	52	15.27
1974 ASM -----	9 123	73	1 852	4.30	37	70	17 847	51	13.21
1973 ASM -----	8 730	77	1 898	3.95	33	66	18 388	47	12.54
1972 Census -----	8 260	76	1 910	3.74	31	66	16 671	50	11.50
INDUSTRY 3823, PROCESS CONTROL INSTRUMENTS									
1987 Census -----	27 650	50	1 996	10.51	33	64	60 022	46	60.14
1986 ASM -----	25 877	50	1 966	10.31	35	65	56 023	46	56.78
1985 ASM -----	25 016	51	1 954	10.03	34	65	55 085	45	55.08
1984 ASM -----	23 571	53	1 970	9.30	31	63	52 571	45	50.55
1983 ASM -----	21 861	48	1 918	9.16	29	62	47 052	46	50.61
1982 Census -----	20 830	50	1 923	8.35	29	60	46 881	44	48.99
1981 ASM -----	18 906	52	1 982	7.56	31	60	45 479	42	43.76
1980 ASM -----	17 527	52	1 996	6.97	33	63	40 029	44	38.60
1979 ASM -----	16 110	53	2 011	6.48	33	64	36 883	44	34.79
1978 ASM -----	15 130	50	1 992	6.12	33	66	31 810	48	31.69
1977 Census -----	14 296	50	2 009	5.66	32	65	30 095	48	29.77
1976 ASM -----	13 061	51	2 006	5.03	31	65	26 798	49	26.28
1975 ASM -----	13 146	46	1 989	4.88	34	77	20 388	64	22.15
1974 ASM -----	12 100	48	2 020	4.56	36	76	20 882	58	21.40
1973 ASM -----	10 808	50	2 034	4.09	33	75	18 120	60	17.81
1972 Census -----	9 632	52	2 016	3.96	31	69	17 427	55	16.72

See footnotes at end of table.

Table 1b-1. Selected Operating Ratios for the Industry (1987 Basis): 1987 and Earlier Years

—Con.

[Industries with only 1987 data are revised for 1987. Table 1b-2 contains historical data on the old SIC basis. See table 1c-1 for composition of the new industry on the old SIC basis. Excludes data for auxiliaries. For meaning of abbreviations and symbols, see introductory text. For explanation of terms, see appendixes]

Year	Payroll per employee (dollars)	Production workers as percent of total employment (percent)	Annual hours of production workers (number)	Average hourly earnings of production workers (dollars)	Cost of materials as percent of value of shipments (percent)	Cost of materials and payroll as percent of value of shipments (percent)	Value added per employee (dollars)	Payroll as percent of value added (percent)	Value added per production worker hour (dollars)
INDUSTRY 3824, FLUID METERS AND COUNTING DEVICES									
1987 Census	23 475	64	1 954	9.44	41	66	56 089	42	44.61
1986 ASM	22 817	60	2 048	8.96	35	62	52 721	43	43.17
1985 ASM	22 750	60	1 903	9.95	36	63	53 337	43	47.01
1984 ASM	21 183	60	1 877	9.80	37	65	48 578	44	43.40
1983 ASM	19 357	63	1 903	8.81	37	65	43 153	45	35.84
1982 Census	17 837	62	1 899	8.35	37	64	41 459	43	35.13
1981 ASM	16 894	68	1 961	7.61	41	69	34 868	48	26.24
1980 ASM	15 024	68	1 965	6.88	41	69	32 339	46	24.04
1979 ASM	13 792	67	1 983	6.07	37	66	31 275	44	23.59
1978 ASM	13 035	69	1 983	5.91	37	66	28 788	45	20.91
1977 Census	12 427	70	2 009	5.24	36	66	26 981	46	19.07
1976 ASM	11 702	69	1 926	5.11	35	66	25 514	46	19.24
1975 ASM	10 738	69	1 946	4.60	34	65	22 164	48	16.59
1974 ASM	9 545	71	2 000	3.99	39	68	20 636	46	14.49
1973 ASM	8 793	68	2 045	3.67	40	66	20 268	43	14.56
1972 Census	8 727	67	1 983	3.68	36	62	20 557	42	15.46
INDUSTRY 3825, INSTRUMENTS TO MEASURE ELECTRICITY									
1987 Census	29 069	52	2 082	11.00	35	67	59 752	49	55.70
1986 ASM	27 332	51	2 014	11.05	35	69	52 613	52	50.84
1985 ASM	24 822	52	1 928	10.63	32	62	55 950	44	55.53
1984 ASM	24 593	55	1 919	9.71	33	63	56 068	44	52.82
1983 ASM	22 879	55	1 901	9.14	33	64	49 201	47	46.90
1982 Census	21 050	55	1 892	8.18	30	61	47 827	44	46.38
1981 ASM	19 545	53	1 926	7.62	31	63	42 981	45	42.14
1980 ASM	17 364	55	1 922	6.63	33	65	37 662	46	35.49
1979 ASM	14 880	57	1 994	5.77	33	65	33 050	45	28.97
1978 ASM	13 998	60	1 943	5.68	38	70	28 226	50	24.40
1977 Census	13 369	61	1 938	5.29	37	69	27 183	49	23.09
1976 ASM	12 425	62	1 918	4.97	36	68	24 666	50	20.85
1975 ASM	11 507	62	1 870	4.66	32	64	23 857	48	20.61
1974 ASM	10 151	64	1 938	4.00	34	68	20 474	50	16.45
1973 ASM	9 365	65	1 985	3.75	34	66	19 797	47	15.44
1972 Census	9 570	63	1 986	3.75	34	68	19 137	50	15.24
INDUSTRY 3826, ANALYTICAL INSTRUMENTS									
1987 Census	28 619	43	1 978	10.76	39	65	67 535	42	78.92
INDUSTRY 3827, OPTICAL INSTRUMENTS AND LENSES									
1987 Census	28 935	56	1 938	11.91	37	68	58 100	50	53.32
INDUSTRY 3829, MEASURING AND CONTROLLING DEVICES, N.E.C.									
1987 Census	26 800	49	1 970	10.40	36	68	55 098	49	56.76

Note: For qualifications of data, see footnotes on table 1a-1.

Table 1b-2. Selected Operating Ratios for the Industry (1972 Basis): 1987 and Earlier Years

[Table 1b-2 contains the historical data on the old SIC basis. See table 1c-1 for composition of the new industry on the old SIC basis. Excludes data for auxiliaries. For meaning of abbreviations and symbols, see introductory text. For explanation of terms, see appendixes]

Year	Payroll per employee (dollars)	Production workers as percent of total employment (percent)	Annual hours of production workers (number)	Average hourly earnings of production workers (dollars)	Cost of materials as percent of value of shipments (percent)	Cost of materials and payroll as percent of value of shipments (percent)	Value added per employee (dollars)	Payroll as percent of value added (percent)	Value added per production worker hour (dollars)
INDUSTRY 3811, ENGINEERING AND SCIENTIFIC INSTRUMENTS									
1987 Census	26 650	59	2 008	11.10	36	64	61 667	43	52.01
1986 ASM	24 442	66	1 914	10.76	37	66	54 031	45	42.72
1985 ASM	23 000	62	1 865	10.12	38	65	55 268	42	47.88
1984 ASM	23 024	60	1 926	9.93	35	63	57 017	40	49.68
1983 ASM	22 392	59	1 931	9.49	32	62	51 737	43	45.72
1982 Census	20 306	61	1 923	8.83	32	61	49 091	41	42.19
1981 ASM	18 772	64	1 964	7.88	33	62	44 674	42	35.72
1980 ASM	17 492	63	2 046	7.00	34	63	40 745	43	31.79
1979 ASM	15 687	64	1 985	6.33	34	63	37 296	42	29.58
1978 ASM	14 346	60	1 964	6.04	35	65	32 853	44	28.00
1977 Census	13 815	58	1 972	5.76	35	66	30 430	45	26.43
1976 ASM	13 234	58	2 020	5.12	34	66	28 133	47	23.86
1975 ASM	12 099	58	2 015	4.84	34	66	23 968	50	20.59
1974 ASM	11 219	61	1 961	4.52	36	69	22 769	49	19.17
1973 ASM	10 399	61	1 936	4.37	37	71	19 809	52	16.90
1972 Census	9 776	60	1 946	4.24	35	70	17 798	55	15.12

See footnotes at end of table.

Table 1b-2. Selected Operating Ratios for the Industry (1972 Basis): 1987 and Earlier Years

—Con.

[Table 1b-2 contains the historical data on the old SIC basis. See table 1c-1 for composition of the new industry on the old SIC basis. Excludes data for auxiliaries. For meaning of abbreviations and symbols, see introductory text. For explanation of terms, see appendixes]

Year	Payroll per employee (dollars)	Production workers as percent of total employment (percent)	Annual hours of production workers (number)	Average hourly earnings of production workers (dollars)	Cost of materials as percent of value of shipments (percent)	Cost of materials and payroll as percent of value of shipments (percent)	Value added per employee (dollars)	Payroll as percent of value added (percent)	Value added per production worker hour (dollars)
INDUSTRY 3829, MEASURING AND CONTROLLING DEVICES, N.E.C.									
1987 Census	26 567	49	1 963	10.29	36	68	53 776	49	55.81
1986 ASM	25 935	53	2 035	9.63	37	69	50 319	52	46.60
1985 ASM	24 141	56	1 939	9.59	36	69	48 047	50	44.17
1984 ASM	24 265	52	1 961	9.26	39	77	39 911	61	39.35
1983 ASM	23 647	44	1 931	9.69	36	76	36 924	64	43.63
1982 Census	21 341	47	1 977	8.47	36	72	37 156	57	40.13
1981 ASM	19 005	48	2 006	7.53	37	73	33 353	57	34.47
1980 ASM	18 155	49	2 011	6.76	43	81	27 886	65	28.44
1979 ASM	16 913	50	1 994	6.17	39	80	26 647	63	26.57
1978 ASM	15 283	50	1 933	6.07	36	76	24 309	63	25.16
1977 Census	14 365	49	2 013	5.49	36	78	23 115	62	23.48
1976 ASM	14 044	49	2 046	4.92	37	81	20 487	69	20.56
1975 ASM	11 611	57	1 992	4.42	34	65	24 134	48	21.28
1974 ASM	10 573	61	2 049	4.11	37	69	21 966	48	17.65
1973 ASM	10 288	63	1 955	4.25	31	67	20 805	49	17.00
1972 Census	10 434	50	2 145	4.06	35	78	16 053	65	14.85
INDUSTRY 3832, OPTICAL INSTRUMENTS AND LENSES									
1987 Census	28 781	48	1 960	11.28	39	66	63 928	45	67.49
1986 ASM	27 775	51	1 906	10.98	39	67	61 799	45	63.07
1985 ASM	25 122	50	1 922	9.68	37	64	59 404	42	61.37
1984 ASM	24 396	50	1 996	9.09	35	62	59 730	41	60.42
1983 ASM	22 721	48	1 964	9.20	36	64	52 786	43	55.51
1982 Census	20 510	51	1 973	8.51	38	65	47 364	43	47.08
1981 ASM	18 127	55	1 950	7.55	38	63	45 882	40	42.72
1980 ASM	18 059	52	1 939	6.76	36	64	42 294	43	41.62
1979 ASM	16 547	53	2 009	6.34	36	66	38 123	43	35.79
1978 ASM	15 594	53	2 022	5.87	35	65	35 752	44	33.51
1977 Census	14 023	57	1 988	5.58	34	66	29 861	47	26.52
1976 ASM	13 262	56	1 979	5.19	33	67	26 433	50	24.06
1975 ASM	12 458	57	1 884	5.02	33	66	25 189	49	23.53
1974 ASM	11 830	59	1 966	4.69	34	66	24 846	48	21.53
1973 ASM	10 870	59	1 927	4.25	33	66	20 838	52	18.36
1972 Census	10 281	55	1 981	4.13	33	68	20 441	50	18.66

Note: For qualifications of data, see footnotes on table 1a-1.

Table 1c-1. 1987 Statistics for the Industry Showing the Distribution of 1987 SIC-Based Industries Among 1972 SIC-Based Industries

[Excludes data for auxiliaries. For meaning of abbreviations and symbols, see introductory text. For explanation of terms, see appendixes]

Industry	All establishments (number)	All employees		Production workers			Value added by manufacture (million dollars)	Cost of materials (million dollars)	Value of shipments (million dollars)	New capital expenditures (million dollars)	End-of-year inventories (million dollars)
		Number (1,000)	Payroll (million dollars)	Number (1,000)	Hours (millions)	Wages (million dollars)					
New Industry 3812, Search and Navigation Equipment	1 084	369.4	12 373.0	158.7	314.3	4 466.2	24 738.7	12 208.3	36 266.8	1 439.1	9 454.6
Old Industry 3662, Radio and Television Communication Equipment	822	347.4	11 763.7	145.1	286.9	4 138.5	23 481.5	11 539.1	34 356.5	1 369.8	8 888.4
Old Industry 3811, Engineering and Scientific Instruments	262	21.9	609.2	13.6	27.5	327.7	1 257.2	669.2	1 910.3	69.3	566.2
New Industry 3821, Laboratory Apparatus and Furniture	260	17.1	440.9	9.6	19.2	195.2	1 142.4	639.8	1 769.3	52.3	398.3
Old Industry 3811, Engineering and Scientific Instruments	260	17.1	440.9	9.6	19.2	195.2	1 142.4	639.8	1 769.3	52.3	398.3
New Industry 3826, Analytical Instruments	562	31.2	892.9	13.5	26.7	287.3	2 107.1	1 363.2	3 468.2	125.5	781.2
Old Industry 3811, Engineering and Scientific Instruments	54	.3	6.4	.2	.4	3.4	13.7	6.4	20.1	(D)	4.8
Old Industry 3832, Optical Instruments and Lenses	508	30.9	886.5	13.3	26.3	283.9	2 093.4	1 356.8	3 448.2	(D)	776.4
New Industry 3827, Optical Instruments and Lenses	250	20.1	581.6	11.3	21.9	260.8	1 167.8	694.7	1 863.6	83.3	610.2
Old Industry 3827, Optical Instruments and Lenses	250	20.1	581.6	11.3	21.9	260.8	1 167.8	694.7	1 863.6	83.3	610.2
New Industry 3829, Measuring and Controlling Devices, N.E.C.	971	41.0	1 098.8	20.2	39.8	413.9	2 259.0	1 228.1	3 442.0	104.0	928.0
Old Industry 3662, Radio and Television Communication Equipment	53	5.3	156.8	2.5	5.1	58.9	302.2	142.5	440.5	16.5	143.1
Old Industry 3811, Engineering and Scientific Instruments	45	2.6	62.7	1.5	2.8	26.3	176.8	100.2	273.6	(D)	59.1
Old Industry 3829, Measuring and Controlling Devices, N.E.C.	857	33.0	876.7	16.2	31.8	327.2	1 774.6	983.9	2 720.7	79.0	724.0
Old Industry 3832, Optical Instruments and Lenses	16	.1	2.6	.1	.2	1.4	5.4	1.5	7.2	(D)	1.8

Note: For qualifications of data, see footnotes on table 1a-1.

Table 1c-2. 1987 Statistics for the Industry Showing the Distribution of 1972 SIC-Based Industries Among 1987 SIC-Based Industries

[Excludes data for auxiliaries. For meaning of abbreviations and symbols, see introductory text. For explanation of terms, see appendixes]

Industry	All establishments (number)	All employees		Production workers			Value added by manufacture (million dollars)	Cost of materials (million dollars)	Value of shipments (million dollars)	New capital expenditures (million dollars)	End-of-year inventories (million dollars)
		Number (1,000)	Payroll (million dollars)	Number (1,000)	Hours (millions)	Wages (million dollars)					
Old Industry 3811, Engineering and Scientific Instruments -----	621	42.0	1 119.3	24.8	49.8	552.6	2 590.0	1 415.6	3 973.3	130.7	1 028.5
New Industry 3812, Search and Navigation Equipment -----	262	21.9	609.2	13.6	27.5	327.7	1 257.2	669.2	1 910.3	69.3	566.2
New Industry 3821, Laboratory Apparatus and Furniture -----	260	17.1	440.9	9.6	19.2	195.2	1 142.4	639.8	1 769.3	52.3	398.3
New Industry 3826, Analytical Instruments -----	54	.3	6.4	.2	.4	3.4	13.7	6.4	20.1	(D)	4.8
New Industry 3829, Measuring and Controlling Devices, N.E.C. -----	45	2.6	62.7	1.5	2.8	26.3	176.8	100.2	273.6	(D)	59.1
Old Industry 3829, Measuring and Controlling Devices, N.E.C. -----	857	33.0	876.7	16.2	31.8	327.2	1 774.6	983.9	2 720.7	79.0	724.0
New Industry 3829, Measuring and Controlling Devices, N.E.C. -----	857	33.0	876.7	16.2	31.8	327.2	1 774.6	983.9	2 720.7	79.0	724.0
Old Industry 3832, Optical Instruments and Lenses -----	774	51.1	1 470.7	24.7	48.4	546.0	3 266.7	2 053.1	5 318.9	208.2	1 388.4
New Industry 3826, Analytical Instruments -----	508	30.9	886.5	13.3	26.3	283.9	2 093.4	1 356.8	3 448.2	(D)	776.4
New Industry 3827, Optical Instruments and Lenses -----	250	20.1	581.6	11.3	21.9	260.8	1 167.8	694.7	1 863.6	83.3	610.2
New Industry 3829, Measuring and Controlling Devices, N.E.C. -----	16	.1	2.6	.1	.2	1.4	5.4	1.5	7.2	(D)	1.8

Note: For qualifications of data, see footnotes on table 1a-1.

Table 2. Industry Statistics for Selected States: 1987 and 1982

[Excludes data for auxiliaries. States with 150 employees or more are shown. For meaning of abbreviations and symbols, see introductory text. For explanation of terms, see appendixes]

Industry and geographic area	1987												1982	
	E ¹	All establishments		All employees		Production workers			Value added by manufacture (million dollars)	Cost of materials (million dollars)	Value of shipments (million dollars)	New capital expenditures (million dollars)	All employees ² (1,000)	Value added by manufacture (million dollars)
		Total (no.)	With 20 employees or more (no.)	Number ² (1,000)	Payroll (million dollars)	Number (1,000)	Hours (millions)	Wages (million dollars)						
INDUSTRY 3812, SEARCH AND NAVIGATION EQUIPMENT														
United States -----	-	1 084	508	369.4	12 373.0	158.7	314.3	4 466.2	24 738.7	12 208.3	36 266.8	1 439.1	(NA)	(NA)
Alabama -----	-	13	5	1.2	33.4	.8	2.0	14.8	77.5	66.3	143.2	7.2	(NA)	(NA)
Arizona -----	-	17	8	10.4	321.0	4.3	8.3	99.9	556.1	378.1	884.9	37.9	(NA)	(NA)
Arkansas -----	E1	9	2	AA	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(NA)	(NA)
California -----	-	244	133	99.5	3 582.9	41.6	81.4	1 313.4	6 730.7	3 007.2	9 810.5	350.1	(NA)	(NA)
Colorado -----	-	27	8	FF	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(NA)	(NA)
Connecticut -----	-	27	16	7.1	235.1	2.7	5.4	60.5	331.7	229.3	545.0	23.4	(NA)	(NA)
Florida -----	-	63	26	25.0	786.8	8.9	19.9	172.9	1 984.6	843.1	2 826.1	95.8	(NA)	(NA)
Georgia -----	E3	13	7	CC	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(NA)	(NA)
Idaho -----	E2	4	2	AA	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(NA)	(NA)
Illinois -----	-	32	18	7.6	233.0	1.8	3.6	39.2	491.9	223.9	648.5	(D)	(NA)	(NA)
Indiana -----	-	11	7	FF	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(NA)	(NA)
Iowa -----	-	5	3	FF	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(NA)	(NA)
Kansas -----	-	22	11	FF	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(NA)	(NA)
Kentucky -----	E9	3	2	BB	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(NA)	(NA)
Louisiana -----	-	5	2	AA	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(NA)	(NA)
Maryland -----	-	28	14	24.6	903.4	9.0	14.5	277.9	1 574.8	876.5	2 452.9	108.4	(NA)	(NA)
Massachusetts -----	-	62	36	22.2	725.0	13.3	26.4	344.9	1 528.1	999.9	2 467.9	87.2	(NA)	(NA)
Michigan -----	-	20	10	4.1	115.0	2.9	5.8	79.6	184.9	198.3	391.9	8.9	(NA)	(NA)
Minnesota -----	-	12	5	FF	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(NA)	(NA)
Missouri -----	-	10	5	FF	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(NA)	(NA)
New Hampshire -----	-	8	4	FF	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(NA)	(NA)
New Jersey -----	-	60	28	21.1	778.6	13.4	25.7	539.6	1 498.8	806.5	2 252.8	84.3	(NA)	(NA)
New Mexico -----	-	6	3	FF	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(NA)	(NA)
New York -----	-	103	50	39.6	1 379.8	15.5	30.2	436.9	2 791.4	1 514.1	4 225.1	127.6	(NA)	(NA)
North Carolina -----	-	13	6	EE	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(NA)	(NA)
Ohio -----	E1	22	5	.8	20.2	.4	.9	8.6	38.1	21.3	63.8	(D)	(NA)	(NA)
Oklahoma -----	-	11	3	CC	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(NA)	(NA)
Oregon -----	E8	14	5	CC	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(NA)	(NA)
Pennsylvania -----	-	42	17	5.4	149.0	2.7	5.5	61.7	281.5	372.2	629.8	19.0	(NA)	(NA)
Rhode Island -----	-	8	3	FF	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(NA)	(NA)
South Carolina -----	-	3	1	BB	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(NA)	(NA)
Texas -----	-	71	31	33.1	1 030.2	13.8	29.6	331.9	2 000.1	829.1	2 743.8	179.3	(NA)	(NA)
Utah -----	-	9	4	FF	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(NA)	(NA)
Virginia -----	-	19	15	10.4	345.4	2.8	5.6	60.2	1 099.8	289.7	1 296.3	47.8	(NA)	(NA)
Washington -----	E2	19	6	.4	8.0	.2	.4	2.9	34.6	7.2	42.0	.7	(NA)	(NA)
Wisconsin -----	-	10	3	CC	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(NA)	(NA)

See footnotes at end of table.

Table 2. Industry Statistics for Selected States: 1987 and 1982—Con.

[Excludes data for auxiliaries. States with 150 employees or more are shown. For meaning of abbreviations and symbols, see introductory text. For explanation of terms, see appendixes]

Industry and geographic area	1987											1982		
	E ¹	All establishments		All employees		Production workers			Value added by manufacture (million dollars)	Cost of materials (million dollars)	Value of shipments (million dollars)	New capital expenditures (million dollars)	All employees ² (1,000)	Value added by manufacture (million dollars)
		Total (no.)	With 20 employees or more (no.)	Number ² (1,000)	Payroll (million dollars)	Number (1,000)	Hours (millions)	Wages (million dollars)						
INDUSTRY 3821, LABORATORY APPARATUS AND FURNITURE														
United States -----	-	260	124	17.1	440.9	9.6	19.2	195.2	1 142.4	639.8	1 769.3	52.3	(NA)	(NA)
Arkansas -----	-	2	2	BB	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(NA)	(NA)
California -----	-	41	18	EE	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(NA)	(NA)
Connecticut -----	-	8	5	.5	12.6	.3	.6	7.2	58.4	28.5	77.1	(D)	(NA)	(NA)
Delaware -----	-	3	1	CC	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(NA)	(NA)
Georgia -----	-	1	1	AA	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(NA)	(NA)
Illinois -----	E1	17	7	EE	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(NA)	(NA)
Iowa -----	-	2	1	AA	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(NA)	(NA)
Maine -----	-	2	2	BB	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(NA)	(NA)
Massachusetts -----	-	20	8	CC	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(NA)	(NA)
Michigan -----	-	9	5	.8	18.4	.4	.9	8.6	42.6	20.7	64.1	(D)	(NA)	(NA)
Minnesota -----	-	5	4	CC	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(NA)	(NA)
Missouri -----	-	6	1	AA	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(NA)	(NA)
Nevada -----	-	3	1	BB	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(NA)	(NA)
New Hampshire -----	-	4	3	BB	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(NA)	(NA)
New Jersey -----	-	19	10	1.7	40.0	1.0	2.0	22.0	85.9	49.8	132.2	4.6	(NA)	(NA)
New York -----	E1	20	8	CC	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(NA)	(NA)
North Carolina -----	-	1	1	CC	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(NA)	(NA)
Ohio -----	-	10	5	CC	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(NA)	(NA)
Oregon -----	-	7	2	AA	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(NA)	(NA)
Pennsylvania -----	-	24	14	1.2	29.7	.8	1.6	17.0	68.7	46.9	120.8	3.3	(NA)	(NA)
Texas -----	-	10	5	BB	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(NA)	(NA)
Wisconsin -----	-	8	5	1.4	31.7	.9	1.7	17.7	57.3	47.3	103.0	(D)	(NA)	(NA)
INDUSTRY 3822, ENVIRONMENTAL CONTROLS														
United States -----	-	254	106	26.5	602.4	18.6	36.2	357.3	1 302.7	759.9	2 068.8	66.3	28.8	1 025.7
Alabama -----	-	2	1	AA	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	AA	(D)
Arizona -----	-	4	1	BB	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(NA)	(NA)
California -----	E1	37	15	3.7	78.6	2.6	4.9	48.4	141.4	125.2	281.2	(D)	4.9	157.6
Connecticut -----	E2	7	3	BB	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	BB	(D)
Florida -----	-	13	3	.4	5.8	.3	.6	3.4	17.3	8.8	26.4	(D)	(NA)	(NA)
Georgia -----	-	4	1	CC	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	CC	(D)
Illinois -----	-	17	11	3.9	99.8	2.5	4.4	56.0	230.2	133.9	363.7	8.0	4.5	150.8
Indiana -----	-	7	6	1.9	42.1	1.6	3.4	30.7	83.5	57.4	137.3	7.8	EE	(D)
Iowa -----	-	4	1	BB	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	CC	(D)
Kentucky -----	-	2	2	BB	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	CC	(D)
Maine -----	E5	2	2	AA	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(NA)	(NA)
Massachusetts -----	E2	14	3	BB	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	EE	(D)
Michigan -----	-	13	4	BB	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	.3	14.0
Minnesota -----	-	11	4	FF	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	FF	(D)
Missouri -----	-	4	3	CC	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	CC	(D)
New Jersey -----	E3	8	3	.2	3.2	.1	.2	1.7	6.2	4.6	10.5	.2	.2	6.3
New Mexico -----	-	1	1	AA	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(NA)	(NA)
New York -----	E3	10	3	AA	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	.6	11.1
Ohio -----	E1	22	14	3.8	72.8	2.9	6.2	49.7	137.2	74.6	212.6	(D)	4.7	138.3
Pennsylvania -----	E1	13	5	1.0	22.9	.7	1.4	16.3	11.0	13.9	23.8	.9	EE	(D)
Rhode Island -----	-	3	3	CC	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	CC	(D)
South Carolina -----	E1	2	2	BB	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	CC	(D)
Tennessee -----	-	6	3	EE	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(NA)	(NA)
Texas -----	E1	12	3	AA	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(NA)	(NA)
Virginia -----	-	2	1	AA	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	AA	(D)
Wisconsin -----	-	5	3	.6	14.2	.5	.9	8.3	27.4	18.9	46.1	(D)	.5	15.9
INDUSTRY 3823, PROCESS CONTROL INSTRUMENTS														
United States -----	E1	785	343	53.4	1 476.5	26.7	53.3	560.1	3 205.2	1 601.4	4 788.9	129.3	60.3	2 826.9
Arizona -----	-	12	7	EE	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	EE	(D)
California -----	E1	165	66	7.6	222.7	3.6	7.1	80.2	479.6	286.3	755.7	19.7	8.5	374.0
Colorado -----	-	14	7	.6	17.6	.2	.5	4.7	57.4	14.5	72.8	2.3	.8	46.4
Connecticut -----	-	36	17	2.9	75.2	1.7	3.1	34.9	175.6	82.5	258.8	6.8	3.7	150.8
Florida -----	E1	16	7	.7	11.6	.5	.8	5.5	31.6	19.6	52.2	(D)	.4	14.5
Illinois -----	-	44	28	3.9	92.5	2.3	4.5	42.6	169.1	81.6	255.0	7.0	4.2	141.5
Indiana -----	E1	18	10	.8	18.2	.4	.8	7.4	38.4	16.6	53.3	(D)	.7	24.5
Kentucky -----	-	1	1	BB	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	BB	(D)
Louisiana -----	-	6	4	.3	6.8	.2	.4	4.6	10.4	13.2	24.8	(D)	.6	15.7
Maryland -----	E6	9	4	BB	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	.2	11.3
Massachusetts -----	-	46	28	4.5	121.9	2.6	5.8	51.5	373.6	138.0	503.8	10.1	6.7	426.8
Michigan -----	E2	34	14	1.1	30.3	.5	1.1	11.3	63.5	32.2	94.9	(D)	.4	18.1
Minnesota -----	-	16	9	FF	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	FF	(D)
Nebraska -----	-	4	4	BB	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(NA)	(NA)
New Jersey -----	E2	37	10	1.0	25.1	.5	.9	8.4	51.6	28.0	79.7	1.3	1.2	47.5

See footnotes at end of table.

Table 2. Industry Statistics for Selected States: 1987 and 1982—Con.

[Excludes data for auxiliaries. States with 150 employees or more are shown. For meaning of abbreviations and symbols, see introductory text. For explanation of terms, see appendixes]

Industry and geographic area	E ¹	1987											1982	
		All establishments		All employees		Production workers			Value added by manufacture (million dollars)	Cost of materials (million dollars)	Value of shipments (million dollars)	New capital expenditures (million dollars)	All employees ² (1,000)	Value added by manufacture (million dollars)
		Total (no.)	With 20 employees or more (no.)	Number ² (1,000)	Payroll (million dollars)	Number (1,000)	Hours (millions)	Wages (million dollars)						
INDUSTRY 3823, PROCESS CONTROL INSTRUMENTS—Con.														
New York	E2	40	16	FF	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	5.2	204.1
North Carolina	E1	16	4	BB	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	AA	(D)
Ohio	-	42	21	3.2	86.6	1.2	2.4	23.8	210.8	86.5	285.1	(D)	2.8	154.4
Oklahoma	-	8	5	1.0	26.8	.5	1.0	10.4	41.9	30.1	76.2	(D)	1.6	77.3
Pennsylvania	-	58	30	8.5	260.8	4.6	9.3	110.5	497.8	250.2	751.4	20.9	11.5	559.3
Tennessee	-	4	2	EE	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	EE	(D)
Texas	-	64	24	3.7	98.4	2.1	4.2	46.9	200.3	171.0	372.0	12.5	2.5	121.0
Virginia	E1	10	4	BB	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	AA	(D)
Washington	E4	13	2	.2	4.0	.1	.2	1.3	9.8	4.5	14.6	(D)	BB	(D)
West Virginia	-	1	1	AA	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	BB	(D)
Wisconsin	E1	12	4	.4	9.7	.2	.3	2.9	27.2	12.8	40.0	(D)	.2	10.0
INDUSTRY 3824, FLUID METERS AND COUNTING DEVICES														
United States	-	158	61	10.1	237.1	6.5	12.7	119.9	566.5	381.2	938.6	34.9	11.1	460.2
Alabama	-	1	1	BB	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	CC	(D)
California	E3	26	7	CC	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	.6	20.9
Colorado	E4	2	2	BB	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	BB	(D)
Connecticut	-	11	5	.9	21.6	.5	1.0	8.0	27.2	24.0	50.7	.8	EE	(D)
Georgia	-	1	1	BB	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	CC	(D)
Illinois	-	11	7	CC	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	.4	22.2
Michigan	E1	9	2	BB	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(NA)	(NA)
Nebraska	-	2	1	BB	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	BB	(D)
New Hampshire	-	3	1	CC	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(NA)	(NA)
North Carolina	-	5	2	CC	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	CC	(D)
Ohio	-	4	2	AA	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(NA)	(NA)
Pennsylvania	-	10	7	2.2	53.9	1.5	3.0	34.1	160.9	84.3	241.0	13.9	2.6	140.4
South Carolina	-	3	1	BB	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	BB	(D)
Texas	-	10	4	.3	8.1	.2	.4	4.5	22.0	9.9	32.4	.7	CC	(D)
Virginia	-	1	1	BB	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	AA	(D)
Wisconsin	-	3	2	CC	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	CC	(D)
INDUSTRY 3825, INSTRUMENTS TO MEASURE ELECTRICITY														
United States	-	930	412	85.2	2 476.7	43.9	91.4	1 005.4	5 090.9	2 662.4	7 703.3	307.5	89.7	4 290.1
Alabama	E2	6	4	.5	21.8	.2	.3	4.1	38.4	20.4	57.9	(D)	(NA)	(NA)
Arizona	E2	18	6	.3	8.1	.1	.3	2.6	13.8	10.5	24.1	.3	CC	(D)
California	-	266	123	19.6	608.3	10.7	23.3	271.3	1 375.4	591.7	1 957.5	97.0	20.4	1 077.5
Colorado	-	24	9	FF	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	FF	(D)
Connecticut	E1	22	12	1.0	22.6	.5	1.1	8.7	46.8	25.7	74.7	1.0	1.4	50.9
Florida	E5	27	11	1.4	27.3	1.2	2.4	19.3	57.1	30.6	78.2	2.5	.5	16.5
Georgia	-	6	3	CC	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	BB	(D)
Illinois	-	34	18	2.3	61.1	1.1	2.3	17.9	152.5	73.6	220.8	6.6	3.2	129.0
Indiana	-	17	6	EE	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	2.2	76.6
Kansas	E1	5	2	CC	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	BB	(D)
Maryland	E1	13	8	.7	18.9	.4	.8	8.3	50.3	22.6	71.4	(D)	.7	28.2
Massachusetts	-	53	28	6.8	237.3	3.0	6.2	76.5	549.2	183.2	675.1	29.6	8.2	350.5
Michigan	E1	30	12	.9	23.4	.6	1.2	12.4	57.0	31.3	79.8	1.7	1.6	67.9
Minnesota	-	16	5	CC	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	1.8	83.3
Missouri	-	5	3	BB	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	CC	(D)
Nevada	-	6	5	1.2	30.6	.5	1.1	9.3	26.4	38.5	65.2	(D)	EE	(D)
New Hampshire	-	23	14	3.5	84.8	2.4	4.7	47.5	208.4	76.7	276.8	12.1	3.4	139.0
New Jersey	E1	47	21	4.1	120.1	1.8	3.9	41.2	242.9	161.3	409.6	11.6	4.7	217.4
New York	E1	59	29	7.5	236.6	4.1	8.5	99.4	290.6	267.8	587.3	18.9	4.7	209.9
North Carolina	-	8	4	EE	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	EE	(D)
Ohio	-	36	17	2.6	63.1	1.4	2.8	23.2	124.0	91.3	209.7	(D)	FF	(D)
Oregon	-	20	8	FF	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	FF	(D)
Pennsylvania	-	39	15	1.5	33.3	1.0	1.8	16.3	103.1	54.6	156.0	2.7	EE	(D)
Rhode Island	-	7	4	.5	11.5	.2	.5	3.4	26.1	13.0	39.0	(D)	.4	17.3
South Carolina	-	5	2	EE	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	EE	(D)
South Dakota	-	1	1	BB	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	AA	(D)
Texas	E3	44	11	EE	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	1.5	51.0
Virginia	-	14	8	EE	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	.2	9.7
Washington	-	31	13	6.2	175.0	2.9	6.2	73.4	478.8	340.3	815.6	22.4	FF	(D)
Wisconsin	E2	12	5	.5	7.4	.4	.8	4.5	14.3	11.1	24.3	1.0	EE	(D)

See footnotes at end of table.

Table 2. Industry Statistics for Selected States: 1987 and 1982—Con.

[Excludes data for auxiliaries. States with 150 employees or more are shown. For meaning of abbreviations and symbols, see introductory text. For explanation of terms, see appendixes]

Industry and geographic area	1987												1982	
	All establishments			All employees		Production workers			Value added by manufac- ture (million dollars)	Cost of materials (million dollars)	Value of shipments (million dollars)	New capital expend- itures (million dollars)	All employ- ees ² (1,000)	Value added by manufac- ture (million dollars)
	E ¹	Total (no.)	With 20 employ- ees or more (no.)	Number ² (1,000)	Payroll (million dollars)	Number (1,000)	Hours (millions)	Wages (million dollars)						
INDUSTRY 3826, ANALYTICAL INSTRUMENTS														
United States -----	E1	562	207	31.2	892.9	13.5	26.7	287.3	2 107.1	1 363.2	3 468.2	125.5	(NA)	(NA)
Arizona -----	E1	10	3	.2	5.0	.1	.1	1.5	13.0	6.1	18.9	1.3	(NA)	(NA)
California -----	E1	132	53	6.5	202.5	2.5	5.1	57.0	523.9	331.1	849.3	29.5	(NA)	(NA)
Colorado -----	E2	14	8	.8	21.4	.4	.7	7.3	48.6	20.7	69.2	3.3	(NA)	(NA)
Connecticut -----	-	11	7	EE	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(NA)	(NA)
Florida -----	-	18	7	2.5	74.4	1.4	2.9	35.2	156.6	74.9	232.9	4.3	(NA)	(NA)
Illinois -----	E2	13	6	BB	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(NA)	(NA)
Maryland -----	-	21	5	.8	21.1	.5	.9	10.6	44.8	37.1	81.2	2.1	(NA)	(NA)
Massachusetts -----	E1	68	33	5.9	173.4	2.3	4.8	50.5	314.2	233.7	552.4	19.1	(NA)	(NA)
Michigan -----	E1	14	4	CC	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(NA)	(NA)
Minnesota -----	-	10	3	CC	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(NA)	(NA)
Nebraska -----	-	4	2	BB	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(NA)	(NA)
New Jersey -----	E2	29	12	1.1	33.7	.5	1.0	11.5	72.7	40.0	112.3	2.7	(NA)	(NA)
New York -----	E2	40	8	EE	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(NA)	(NA)
Ohio -----	E1	19	3	1.0	25.5	.5	.9	6.9	49.0	11.2	60.8	(D)	(NA)	(NA)
Oregon -----	E3	12	4	.4	8.6	.1	.3	2.3	12.9	9.7	22.8	(D)	(NA)	(NA)
Pennsylvania -----	-	37	14	2.0	58.8	.9	1.9	21.6	160.2	92.1	254.9	5.0	(NA)	(NA)
Texas -----	-	25	12	FF	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(NA)	(NA)
Virginia -----	E4	7	3	BB	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(NA)	(NA)
Washington -----	E2	10	3	AA	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(NA)	(NA)
Wisconsin -----	-	12	4	EE	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(NA)	(NA)
INDUSTRY 3827, OPTICAL INSTRUMENTS AND LENSES														
United States -----	-	250	127	20.1	581.6	11.3	21.9	260.8	1 167.8	694.7	1 863.6	83.3	(NA)	(NA)
California -----	-	78	35	6.4	187.5	3.3	6.5	77.6	438.3	228.8	636.1	(D)	(NA)	(NA)
Colorado -----	E4	3	2	BB	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(NA)	(NA)
Connecticut -----	-	8	6	1.9	86.4	.9	1.8	25.1	157.6	77.4	248.7	(D)	(NA)	(NA)
Florida -----	-	9	6	.5	12.2	.3	.7	6.0	20.3	15.9	35.3	(D)	(NA)	(NA)
Illinois -----	-	8	4	BB	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(NA)	(NA)
Maryland -----	-	3	1	BB	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(NA)	(NA)
Massachusetts -----	-	29	18	FF	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(NA)	(NA)
Mississippi -----	-	3	3	AA	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(NA)	(NA)
Missouri -----	-	3	2	AA	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(NA)	(NA)
New Hampshire -----	-	7	4	EE	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(NA)	(NA)
New Jersey -----	E2	11	5	.3	8.7	.1	.2	2.6	19.1	7.3	27.1	.9	(NA)	(NA)
New York -----	-	30	14	1.3	44.5	.8	1.7	23.0	73.2	43.2	116.9	2.3	(NA)	(NA)
Ohio -----	E1	3	3	CC	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(NA)	(NA)
Oregon -----	-	5	3	CC	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(NA)	(NA)
Pennsylvania -----	-	14	6	.5	10.6	.3	.7	6.6	21.3	11.3	31.8	3.0	(NA)	(NA)
Texas -----	-	2	1	CC	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(NA)	(NA)
INDUSTRY 3829, MEASURING AND CONTROLLING DEVICES, N.E.C.														
United States -----	-	971	304	41.0	1 098.8	20.2	39.8	413.9	2 259.0	1 228.1	3 442.0	104.0	(NA)	(NA)
Alabama -----	-	6	1	AA	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(NA)	(NA)
California -----	E1	174	62	5.0	137.5	2.5	5.2	51.6	289.1	161.0	455.6	(D)	(NA)	(NA)
Colorado -----	E2	29	3	BB	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(NA)	(NA)
Connecticut -----	-	44	17	2.5	69.5	1.3	2.3	22.2	134.2	58.2	183.1	4.9	(NA)	(NA)
Florida -----	-	35	6	1.3	32.7	.6	1.3	11.5	72.7	40.3	113.4	4.3	(NA)	(NA)
Georgia -----	E2	11	2	AA	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(NA)	(NA)
Illinois -----	-	46	13	2.3	65.0	.9	1.6	13.9	152.8	98.7	241.8	7.4	(NA)	(NA)
Indiana -----	E3	15	2	.2	4.2	.1	.2	1.1	7.0	3.4	10.5	.3	(NA)	(NA)
Maryland -----	-	15	8	1.1	26.1	.6	1.1	10.1	41.5	29.5	73.0	3.5	(NA)	(NA)
Massachusetts -----	-	52	16	3.0	90.9	1.5	3.0	36.0	198.0	87.0	269.5	(D)	(NA)	(NA)
Michigan -----	E1	46	19	1.1	30.2	.6	1.2	13.0	43.8	47.5	96.3	(D)	(NA)	(NA)
Minnesota -----	-	22	5	1.4	43.8	.8	1.6	24.8	105.7	45.1	148.8	5.3	(NA)	(NA)
New Hampshire -----	E1	4	1	.2	4.0	.1	.2	1.8	5.2	3.6	8.7	.5	(NA)	(NA)
New Jersey -----	-	43	14	1.9	46.6	.9	1.9	17.1	113.0	68.8	178.5	3.7	(NA)	(NA)
New Mexico -----	-	4	1	AA	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(NA)	(NA)
New York -----	-	72	34	FF	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(NA)	(NA)
North Carolina -----	-	16	4	CC	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(NA)	(NA)
Ohio -----	-	62	23	4.0	118.7	1.7	3.3	34.0	204.9	135.2	345.7	(D)	(NA)	(NA)
Pennsylvania -----	-	40	17	2.9	70.8	1.9	3.8	40.4	142.9	68.0	206.8	5.9	(NA)	(NA)
Rhode Island -----	E2	9	3	.2	4.1	.1	.2	1.8	9.6	6.3	16.5	(D)	(NA)	(NA)
Tennessee -----	E1	13	6	.6	17.8	.3	.7	6.5	39.4	21.3	61.3	(D)	(NA)	(NA)
Texas -----	E1	77	25	2.3	59.2	1.2	2.4	25.9	124.4	90.9	218.3	4.9	(NA)	(NA)
Vermont -----	-	4	2	FF	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(NA)	(NA)
Washington -----	-	31	8	2.1	67.2	1.0	2.0	27.7	141.0	33.0	173.9	(D)	(NA)	(NA)
Wisconsin -----	E2	20	5	.4	7.0	.3	.5	4.0	18.4	14.6	33.0	(D)	(NA)	(NA)

See footnotes at end of table.

Table 2. Industry Statistics for Selected States: 1987 and 1982—Con.

Note: For qualifications of data, see footnotes on table 1a-1.

¹Payroll and sales data for some small single-unit companies with up to 20 employees (cutoff varied by industry) were obtained from administrative records of other Government agencies rather than from census report forms. These data were then used in conjunction with industry averages to estimate the items shown for these small establishments. This technique was also used for a small number of other establishments whose reports were not received at the time data were tabulated. The following symbols are shown for those States where estimated value of shipments data based on administrative-record data account for 10 percent or more of figure shown: E1—10 to 19 percent; E2—20 to 29 percent; E3—30 to 39 percent; E4—40 to 49 percent; E5—50 to 59 percent; E6—60 to 69 percent; E7—70 to 79 percent; E8—80 to 89 percent; E9—90 percent or more.

²Statistics for some producing States have been withheld to avoid disclosing data for individual companies. However, for States with 150 employees or more, number of establishments is shown and employment-size range is indicated by one of the following symbols: AA—150 to 249 employees; BB—250 to 499 employees; CC—500 to 999 employees; EE—1,000 to 2,499 employees; FF—2,500 employees or more.

Table 3a. Summary Statistics for the Industry: 1987

[For meaning of abbreviations and symbols, see introductory text. For explanation of terms, see appendices]

Item	Search and navigation equipment (SIC 3812)	Laboratory apparatus and furniture (SIC 3821)	Environmental controls (SIC 3822)	Process control instruments (SIC 3823)	Fluid meters and counting devices (SIC 3824)	Instruments to measure electricity (SIC 3825)	Analytical instruments (SIC 3826)	Optical instruments and lenses (SIC 3827)	Measuring and controlling devices, n.e.c. (SIC 3829)
Companies ----- number--	920	246	233	708	138	862	528	236	939
All establishments ----- do--	1 084	260	254	785	158	930	562	250	971
With 1 to 19 employees ----- do--	576	136	148	442	97	518	355	123	667
With 20 to 99 employees ----- do--	263	76	61	222	31	267	139	85	215
With 100 employees or more ----- do--	245	48	45	121	30	145	68	42	89
Employment and labor costs:									
Employees ----- 1,000--	369.4	17.1	26.5	53.4	10.1	85.2	31.2	20.1	41.0
Compensation, total ----- mil dol--	15 049.9	529.2	747.2	1 804.8	294.2	2 944.5	1 083.4	710.5	1 336.3
Annual payroll ----- do--	12 373.0	440.9	602.4	1 476.5	237.1	2 476.7	892.9	581.6	1 098.8
Fringe benefits ----- do--	2 676.9	88.3	144.7	328.3	57.1	467.8	190.5	128.9	237.6
Social Security and other legally required payments ----- do--	981.9	38.7	60.2	138.7	23.2	209.6	75.9	47.9	99.6
Employer payments and other programs ----- do--	1 695.0	49.6	84.6	189.6	33.9	258.2	114.6	81.0	138.0
Production workers:									
Average for year ----- 1,000--	158.7	9.6	18.6	26.7	6.5	43.9	13.5	11.3	20.2
March ----- do--	158.7	9.6	18.9	26.1	6.4	44.4	13.5	11.3	20.3
May ----- do--	158.9	9.4	18.7	26.5	6.5	44.0	13.5	11.3	20.2
August ----- do--	158.5	9.5	18.3	26.6	6.5	43.5	13.5	11.4	20.1
November ----- do--	158.4	9.7	18.4	27.2	6.5	43.3	13.5	11.2	20.1
Hours ----- millions--	314.3	19.2	36.2	53.3	12.7	91.4	26.7	21.9	39.8
January to March ----- do--	78.8	4.7	9.2	13.0	3.2	22.7	6.7	5.4	9.9
April to June ----- do--	78.7	4.8	9.2	13.4	3.3	22.9	6.7	5.6	10.0
July to September ----- do--	78.8	4.9	8.7	13.3	3.1	22.7	6.6	5.5	9.8
October to December ----- do--	78.1	4.9	9.2	13.7	3.1	23.0	6.7	5.5	10.0
Wages ----- mil dol--	4 466.2	195.2	357.3	560.1	119.9	1 005.4	287.3	260.8	413.9
Value added by manufacture ----- do--	24 738.7	1 142.4	1 302.7	3 205.2	566.5	5 090.9	2 107.1	1 167.8	2 259.0
Cost of materials ¹ ----- do--	12 208.3	639.8	759.9	1 601.4	381.2	2 662.4	1 363.2	694.7	1 228.1
Materials, parts, containers, etc., consumed ² ----- do--	10 476.5	526.1	667.0	1 427.5	346.0	2 265.3	1 201.5	589.2	1 085.2
Resales ----- do--	57.5	63.1	44.3	78.4	20.3	152.1	110.7	60.0	79.2
Fuels ----- do--	33.0	4.9	4.8	8.5	2.4	16.4	4.1	3.7	6.0
Purchased electricity ----- do--	292.9	12.2	21.0	39.9	8.8	63.0	22.2	21.1	29.5
Contract work ----- do--	1 348.5	33.5	22.9	47.1	3.7	165.7	24.7	20.7	28.1
Quantity of electric energy used for heat and power:									
Purchased ----- mil kWh--	4 763.0	202.0	370.6	618.1	166.4	1 086.2	341.3	308.3	472.7
Generated less sold ----- do--	(D)	-	-	(D)	-	(D)	-	-	(D)
Total value of shipments ----- mil dol--	36 266.8	1 769.3	2 068.8	4 788.9	938.6	7 703.3	3 468.2	1 863.6	3 442.0
Primary products ----- do--	30 632.7	1 482.9	1 796.7	4 039.2	861.7	6 972.9	2 844.0	1 595.7	2 723.5
Secondary products ----- do--	3 909.9	174.8	147.5	367.1	46.7	345.6	441.5	161.7	428.7
Miscellaneous receipts, total ----- do--	1 724.2	111.6	124.5	382.6	30.3	384.8	182.8	106.1	289.7
Value of resales ----- do--	89.6	73.7	73.6	122.3	25.0	200.3	123.8	79.4	119.7
Contract receipts ----- do--	35.2	(D)	(D)	10.2	(D)	22.7	(D)	17.7	23.9
Sales of scrap and refuse ----- do--	(X)	.4	2.4	.4	(D)	(D)	.1	(D)	(X)
Receipts for research and developmental work ----- do--	1 172.0	.6	.3	(D)	-	5.4	4.7	4.4	2.6
Receipts for repair work (maintenance) ----- do--	(D)	5.5	(D)	26.2	2.7	107.6	22.7	.7	34.8
Receipts for installation (or construction) of products of this establishment ----- do--	(D)	11.1	(D)	10.7	(Z)	(D)	(D)	(D)	24.6
Receipts for engineering and software services ----- do--	(X)	(Z)	(Z)	(D)	(Z)	17.3	(D)	(D)	(X)
Other miscellaneous receipts ----- do--	280.6	(D)	(D)	56.0	1.3	27.1	13.2	3.1	84.1
Inventories by stage of fabrication:									
Beginning of 1987 ----- mil dol--	8 701.5	385.1	371.4	1 087.0	159.7	1 777.0	759.2	599.4	890.2
Finished goods ----- do--	349.3	89.9	102.7	228.8	33.7	319.1	255.4	194.5	173.3
Work in process ----- do--	7 614.7	123.6	192.3	382.5	78.0	872.4	223.9	285.1	423.8
Materials and supplies ----- do--	737.4	171.6	76.4	475.8	48.0	585.5	280.0	119.8	293.0
End of 1987 ----- do--	9 454.6	398.3	374.0	1 094.2	177.4	1 878.7	781.2	610.2	928.0
Finished goods ----- do--	244.8	93.1	112.2	237.0	44.5	351.6	260.8	131.6	184.3
Work in process ----- do--	8 399.5	133.3	176.6	392.0	76.3	889.8	220.5	347.0	458.0
Materials and supplies ----- do--	810.4	171.9	85.2	465.3	56.5	637.3	299.9	131.6	285.7
Primary product specialization ratio ----- percent--	89	89	92	92	95	95	87	91	86
Coverage ratio ----- do--	90	92	89	92	76	92	90	80	80

Note: For qualifications of data, see footnotes on table 1a-1.

¹Data on purchased services for the repair of buildings and machinery and for communication services are not included in cost of materials, etc., but are shown in table 3c.

²Data on materials consumed by type are shown in table 7. Data on amount purchased or transferred from foreign sources are shown in table 3c.

Table 3b. Gross Book Value of Depreciable Assets, Capital Expenditures, Retirements, Depreciation, and Rental Payments: 1987

[Million dollars. For meaning of abbreviations and symbols, see introductory text. For explanation of terms, see appendixes]

Item	Search and navigation equipment (SIC 3812)	Laboratory apparatus and furniture (SIC 3821)	Environmental controls (SIC 3822)	Process control instruments (SIC 3823)	Fluid meters and counting devices (SIC 3824)	Instruments to measure electricity (SIC 3825)	Analytical instruments (SIC 3826)	Optical instruments and lenses (SIC 3827)	Measuring and controlling devices, n.e.c. (SIC 3829)
Gross book value of depreciable assets:									
Total:									
Beginning of year	10 507.1	488.6	626.4	1 336.9	338.1	2 719.8	806.5	643.8	1 084.3
New capital expenditures ¹	1 439.1	52.3	66.3	129.3	34.9	307.5	125.5	83.3	104.0
Used capital expenditures	64.7	2.3	3.7	18.4	2.8	19.3	10.5	6.6	4.3
Retirements	396.9	19.6	57.0	43.2	14.9	133.8	32.7	19.4	48.7
End of year	11 614.0	523.7	639.4	1 441.4	361.1	2 912.8	909.8	714.3	1 143.9
Buildings and other structures:									
Beginning of year	3 603.6	204.1	198.4	453.7	76.6	885.7	273.1	214.9	303.7
New capital expenditures	250.3	12.2	7.6	25.2	5.8	56.1	25.3	24.2	18.8
Used capital expenditures	21.1	.8	.2	6.9	1.8	3.9	6.5	5.4	1.2
Retirements	74.3	6.2	18.0	6.9	1.6	24.3	6.7	4.4	5.5
End of year	3 800.7	210.9	188.2	478.8	82.6	921.5	298.2	240.0	318.2
Machinery and equipment:									
Beginning of year	6 903.5	284.5	428.0	883.2	261.5	1 834.1	533.4	428.9	780.6
New capital expenditures ¹	1 188.7	40.1	58.6	104.1	29.2	251.4	100.1	59.2	85.2
Used capital expenditures	43.6	1.6	3.5	11.5	1.0	15.3	4.1	1.2	3.1
Retirements	322.6	13.4	39.0	36.2	13.2	109.5	25.9	15.0	43.2
End of year	7 813.2	312.7	451.2	962.6	278.5	1 991.3	611.7	474.3	825.7
Depreciation charges during 1987:									
Total	1 323.8	43.8	55.1	135.3	30.9	272.8	85.5	58.4	100.3
Buildings and other structures	227.1	13.3	10.8	20.6	4.7	50.7	12.7	10.3	14.5
Machinery and equipment	1 096.7	30.5	44.3	114.7	26.2	222.0	72.8	48.1	85.9
Rental payments:									
Total	420.1	12.6	14.9	55.8	5.7	117.1	48.6	28.8	40.5
Buildings and other structures	255.7	6.1	6.7	26.7	2.2	69.1	22.0	15.4	21.0
Machinery and equipment	164.4	6.4	8.3	29.2	3.5	48.0	26.6	13.4	19.5

Note: Retirements and depreciation data for establishments not included in the ASM sample were extrapolated from the historical ratio of retirements or depreciation to assets. These ratios were developed at the industry level.

¹Data on new machinery and equipment expenditures by type are provided in table 3c.

Table 3c. Supplemental Industry Statistics Based on Sample Estimates: 1987

[For meaning of abbreviations and symbols, see introductory text. For explanation of terms, see appendixes]

Item	Search and navigation equipment (SIC 3812)		Laboratory apparatus and furniture (SIC 3821)		Environmental controls (SIC 3822)		Process control instruments (SIC 3823)	
	Amount (million dollars)	Relative standard error of estimate ¹ (percent)	Amount (million dollars)	Relative standard error of estimate ¹ (percent)	Amount (million dollars)	Relative standard error of estimate ¹ (percent)	Amount (million dollars)	Relative standard error of estimate ¹ (percent)
Purchased services:								
Cost of purchased services for the repair of-								
Buildings and other structures	79.6	(X)	2.1	(X)	2.0	(X)	8.3	(X)
Response coverage ratio (percent) ²	78.3	(X)	98.7	(X)	73.3	(X)	64.0	(X)
Machinery	158.7	(X)	5.4	(X)	8.9	(X)	14.4	(X)
Response coverage ratio (percent) ²	77.8	(X)	98.7	(X)	73.3	(X)	64.6	(X)
Cost of purchased communication services	127.3	(X)	6.7	(X)	4.8	(X)	17.9	(X)
Response coverage ratio (percent) ²	79.0	(X)	92.0	(X)	73.3	(X)	62.2	(X)
New machinery and equipment expenditures	1 188.7	(X)	40.1	(X)	58.6	(X)	104.1	(X)
Automobiles, trucks, etc., for highway use	27.4	1	(S)	23	.3	1	4.2	5
Computers and peripheral data processing equipment	279.7	1	(S)	14	13.8	3	19.4	7
All other	881.6	1	(S)	3	44.6	1	80.5	2
Adjustment ratio ³	1.2	(X)	(S)	(X)	1.3	(X)	1.3	(X)
Cost of materials, components, parts, etc., used	10 476.5	(X)	526.1	(X)	667.0	(X)	1 427.5	(X)
Materials purchased or transferred from foreign sources ⁴	232.9	6	24.7	10	46.7	7	100.5	20
Materials purchased or transferred from domestic sources	10 243.5	1	501.4	1	620.2	1	1 327.0	2
Adjustment ratio ³	1.4	(X)	1.2	(X)	1.4	(X)	1.9	(X)

Item	Fluid meters and counting devices (SIC 3824)		Instruments to measure electricity (SIC 3825)		Analytical instruments (SIC 3826)		Optical instruments and lenses (SIC 3827)		Measuring and controlling devices, n.e.c. (SIC 3829)	
	Amount (million dollars)	Relative standard error of estimate ¹ (percent)	Amount (million dollars)	Relative standard error of estimate ¹ (percent)	Amount (million dollars)	Relative standard error of estimate ¹ (percent)	Amount (million dollars)	Relative standard error of estimate ¹ (percent)	Amount (million dollars)	Relative standard error of estimate ¹ (percent)
Purchased services:										
Cost of purchased services for the repair of-										
Buildings and other structures	1.6	(X)	11.6	(X)	4.3	(X)	2.7	(X)	5.6	(X)
Response coverage ratio (percent) ²	71.2	(X)	70.6	(X)	55.8	(X)	70.9	(X)	69.0	(X)
Machinery	3.1	(X)	30.3	(X)	8.5	(X)	5.9	(X)	9.8	(X)
Response coverage ratio (percent) ²	71.2	(X)	70.6	(X)	55.8	(X)	70.9	(X)	69.2	(X)
Cost of purchased communication services	3.2	(X)	31.0	(X)	14.2	(X)	5.8	(X)	12.6	(X)
Response coverage ratio (percent) ²	71.2	(X)	70.1	(X)	55.8	(X)	65.5	(X)	65.8	(X)
New machinery and equipment expenditures	29.2	(X)	251.4	(X)	100.1	(X)	59.2	(X)	85.2	(X)
Automobiles, trucks, etc., for highway use4	28	2.2	13	6.6	6	.6	23	3.9	11
Computers and peripheral data processing equipment	2.1	3	68.3	9	14.5	9	7.3	14	16.9	10
All other	26.7	1	180.8	4	79.0	2	51.2	3	64.4	4
Adjustment ratio ³	1.2	(X)	1.3	(X)	1.3	(X)	1.1	(X)	1.3	(X)

See footnotes at end of table.

Table 3c. Supplemental Industry Statistics Based on Sample Estimates: 1987—Con.

[For meaning of abbreviations and symbols, see introductory text. For explanation of terms, see appendixes]

Item	Fluid meters and counting devices (SIC 3824)		Instruments to measure electricity (SIC 3825)		Analytical instruments (SIC 3826)		Optical instruments and lenses (SIC 3827)		Measuring and controlling devices, n.e.c. (SIC 3829)	
	Amount (million dollars)	Relative standard error of estimate ¹ (percent)	Amount (million dollars)	Relative standard error of estimate ¹ (percent)	Amount (million dollars)	Relative standard error of estimate ¹ (percent)	Amount (million dollars)	Relative standard error of estimate ¹ (percent)	Amount (million dollars)	Relative standard error of estimate ¹ (percent)
Cost of materials, components, parts, etc., used	346.0	(X)	2 265.3	(X)	1 201.5	(X)	589.2	(X)	1 085.2	(X)
Materials purchased or transferred from foreign sources ⁴	20.0	16	161.7	4	238.9	7	68.4	6	61.4	9
Materials purchased or transferred from domestic sources	326.0	1	2 103.6	1	962.6	2	520.8	1	1 023.8	1
Adjustment ratio ³	1.5	(X)	1.6	(X)	1.5	(X)	1.3	(X)	1.7	(X)

¹For description of relative standard error of estimate, see Qualifications of the Data in appendixes.²Measure of extent to which respondents reported each item. Derived for each item by calculating the ratio of weighted employment for those sample establishments that reported the specific inquiry to total employment for all establishments classified in industry. (See appendixes for explanation of sample weight.)³Detail has been adjusted upwards to account for nonresponse. Inverse of the ratio shown represents a measure of the response to the inquiry. (See appendixes for further explanation.)⁴Data may understate the true cost of imported parts, components, and supplies since some respondents do not know the origin of these materials. Includes cases where materials were purchased from secondary suppliers or where they were transferred from company-operated warehouses or other distribution points. Direct purchases from foreign suppliers and importers by domestic manufacturing establishments are believed to be reported accurately.

Table 4. Industry Statistics by Employment Size of Establishment: 1987

[For meaning of abbreviations and symbols, see introductory text. For explanation of terms, see appendixes]

Industry and employment size class	E ¹	All establishments (no.)	All employees		Production workers			Value added by manufacture (million dollars)	Cost of materials (million dollars)	Value of shipments (million dollars)	New capital expenditures (million dollars)	End-of-year inventories (million dollars)
			Number (1,000)	Payroll (million dollars)	Number (1,000)	Hours (millions)	Wages (million dollars)					
INDUSTRY 3812, SEARCH AND NAVIGATION EQUIPMENT												
Total -----	-	1 084	369.4	12 373.0	158.7	314.3	4 466.2	24 738.7	12 208.3	36 266.8	1 439.1	9 454.6
Establishments with an average of—												
1 to 4 employees -----	E8	298	.5	11.7	.2	.5	4.8	25.3	12.3	37.9	1.3	9.9
5 to 9 employees -----	E8	134	.9	21.8	.5	1.0	9.6	43.8	21.9	66.0	2.6	17.4
10 to 19 employees -----	E7	144	2.0	50.5	1.0	2.0	20.9	105.6	52.5	157.8	5.3	38.3
20 to 49 employees -----	E7	194	6.2	161.1	3.2	6.2	66.8	330.9	151.6	480.5	19.4	121.8
50 to 99 employees -----	E6	69	4.8	121.7	2.5	4.9	51.1	229.5	139.7	375.6	11.0	87.6
100 to 249 employees -----	E2	79	12.9	335.5	7.4	14.6	158.1	723.8	502.4	1 219.5	48.8	359.0
250 to 499 employees -----	E1	44	15.3	411.3	8.4	16.8	169.3	748.9	547.9	1 328.4	57.9	334.2
500 to 999 employees -----	E1	38	27.7	847.3	14.7	30.1	327.0	1 807.5	934.5	2 678.4	110.5	724.3
1,000 to 2,499 employees -----	-	44	72.8	2 488.1	27.8	54.5	759.7	4 373.7	2 040.4	6 426.0	271.9	1 955.8
2,500 employees or more -----	-	40	226.2	7 924.1	93.1	183.9	2 898.8	16 349.6	7 805.1	23 496.7	910.2	5 806.3
Covered by administrative records ² -----	E9	384	2.3	46.3	1.1	2.2	18.9	95.8	46.2	142.0	5.4	35.1
INDUSTRY 3821, LABORATORY APPARATUS AND FURNITURE												
Total -----	-	260	17.1	440.9	9.6	19.2	195.2	1 142.4	639.8	1 769.3	52.3	398.3
Establishments with an average of—												
1 to 4 employees -----	E7	56	.1	2.1	.1	.1	1.1	5.0	3.5	8.4	.5	3.3
5 to 9 employees -----	E7	37	.2	5.3	.1	.3	2.8	12.5	6.0	18.2	.5	4.5
10 to 19 employees -----	E3	43	.6	15.5	.4	.7	7.5	31.1	16.6	47.6	1.1	9.5
20 to 49 employees -----	E1	50	1.6	39.5	1.0	2.0	18.0	87.3	52.6	137.8	4.2	30.9
50 to 99 employees -----	-	26	1.9	45.1	1.0	2.0	20.6	129.0	67.9	201.3	5.8	34.3
100 to 249 employees -----	-	33	5.3	138.1	2.9	6.2	55.4	290.4	165.9	452.4	11.3	100.8
250 to 499 employees -----	-	10	3.5	90.2	2.3	4.3	52.6	316.7	156.1	462.1	13.3	87.8
500 to 999 employees -----	-	4	3.9	105.0	1.8	3.6	37.2	270.5	171.3	441.5	15.7	127.3
1,000 to 2,499 employees -----	-	1	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Covered by administrative records ² -----	E9	95	.5	9.6	.3	.6	5.1	21.9	10.2	32.1	1.1	7.7
INDUSTRY 3822, ENVIRONMENTAL CONTROLS												
Total -----	-	254	26.5	602.4	18.6	36.2	357.3	1 302.7	759.9	2 068.8	66.3	374.0
Establishments with an average of—												
1 to 4 employees -----	E8	68	.1	2.5	.1	.2	1.5	6.2	3.1	9.3	.3	1.6
5 to 9 employees -----	E9	29	.2	4.0	.1	.3	2.5	8.1	4.3	12.4	.4	2.1
10 to 19 employees -----	E6	51	.7	14.0	.5	.9	8.3	32.9	19.2	51.7	1.0	9.0
20 to 49 employees -----	E4	36	1.1	21.6	.7	1.4	10.7	46.7	30.7	78.1	8.6	15.3
50 to 99 employees -----	E1	25	1.8	39.2	1.2	2.3	20.5	92.4	66.9	160.1	2.8	22.5
100 to 249 employees -----	-	18	2.8	56.5	1.8	3.4	25.5	149.1	104.8	253.9	3.5	43.1
250 to 499 employees -----	-	14	5.3	100.8	4.0	8.0	67.5	219.5	150.4	374.7	11.6	78.8
500 to 999 employees -----	-	8	6.0	139.0	4.0	7.4	80.5	295.8	163.1	461.7	16.7	90.8
1,000 to 2,499 employees -----	-	4	8.6	224.7	6.2	12.3	140.4	452.0	217.4	666.9	21.3	110.7
2,500 employees or more -----	-	1	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Covered by administrative records ² -----	E9	129	1.1	20.4	.8	1.5	12.7	43.3	21.9	65.3	1.4	10.4

See footnotes at end of table.

Table 4. Industry Statistics by Employment Size of Establishment: 1987—Con.

[For meaning of abbreviations and symbols, see introductory text. For explanation of terms, see appendixes]

Industry and employment size class	E ¹	All establishments (no.)	All employees		Production workers			Value added by manufacture (million dollars)	Cost of materials (million dollars)	Value of shipments (million dollars)	New capital expenditures (million dollars)	End-of-year inventories (million dollars)
			Number (1,000)	Payroll (million dollars)	Number (1,000)	Hours (millions)	Wages (million dollars)					
INDUSTRY 3823, PROCESS CONTROL INSTRUMENTS												
Total -----	E1	785	53.4	1 476.5	26.7	53.3	560.1	3 205.2	1 601.4	4 788.9	129.3	1 094.2
Establishments with an average of—												
1 to 4 employees -----	E8	180	.3	7.6	.1	.3	2.8	17.5	7.9	25.4	.4	5.6
5 to 9 employees -----	E7	119	.8	18.9	.4	.7	6.9	46.0	23.8	69.8	1.6	15.3
10 to 19 employees -----	E7	143	2.0	50.7	1.0	2.0	19.5	123.7	59.7	182.2	3.7	39.5
20 to 49 employees -----	E2	131	4.3	102.0	2.2	4.3	41.1	227.3	124.6	353.2	5.7	75.8
50 to 99 employees -----	E1	91	6.4	167.0	3.3	6.3	64.0	366.7	180.8	544.5	16.3	123.3
100 to 249 employees -----	-	77	11.8	301.7	5.9	11.6	110.6	680.1	368.3	1 060.0	26.4	247.4
250 to 499 employees -----	-	28	9.6	270.3	5.1	9.5	107.6	588.7	315.9	894.9	21.3	186.6
500 to 999 employees -----	-	8	6.6	181.9	4.5	9.8	103.1	468.8	229.2	692.4	21.3	150.1
1,000 to 2,499 employees -----	-	8	11.5	376.4	4.2	8.8	104.6	686.2	291.2	966.7	32.4	250.5
Covered by administrative records ² -----	E9	360	2.5	56.1	1.2	2.3	20.8	129.8	57.2	187.0	3.4	41.3
INDUSTRY 3824, FLUID METERS AND COUNTING DEVICES												
Total -----	-	158	10.1	237.1	6.5	12.7	119.9	566.5	381.2	938.6	34.9	177.4
Establishments with an average of—												
1 to 4 employees -----	E9	41	.1	1.7	.1	.1	.8	3.7	2.5	6.2	.2	1.0
5 to 9 employees -----	E8	31	.2	4.9	.1	.3	2.7	10.3	6.7	17.0	.5	3.1
10 to 19 employees -----	E4	25	.3	7.6	.2	.4	3.5	15.6	12.1	28.3	.7	5.2
20 to 49 employees -----	E1	21	.7	14.1	.4	.9	7.8	29.3	17.9	47.7	.7	11.0
50 to 99 employees -----	E1	10	.7	14.3	.4	.8	7.0	24.6	17.0	42.5	.7	9.8
100 to 249 employees -----	-	16	2.4	56.1	1.5	3.0	28.6	153.2	83.5	240.5	3.7	37.5
250 to 499 employees -----	-	12	5.8	138.4	3.7	7.2	69.4	329.8	241.6	556.5	28.5	109.7
500 to 999 employees -----	-	2	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Covered by administrative records ² -----	E9	72	.4	9.1	.3	.6	4.8	19.1	13.0	32.1	.9	5.4
INDUSTRY 3825, INSTRUMENTS TO MEASURE ELECTRICITY												
Total -----	-	930	85.2	2 476.7	43.9	91.4	1 005.4	5 090.9	2 662.4	7 703.3	307.5	1 878.7
Establishments with an average of—												
1 to 4 employees -----	E9	216	.4	9.4	.3	.5	3.9	21.2	9.9	31.1	1.0	6.3
5 to 9 employees -----	E9	164	1.1	26.8	.6	1.2	11.3	58.9	26.2	85.2	2.9	15.8
10 to 19 employees -----	E6	138	1.9	47.8	1.0	2.0	20.2	109.1	50.9	160.4	4.8	29.5
20 to 49 employees -----	E3	171	5.3	135.5	2.6	5.0	48.7	286.6	139.7	425.2	11.4	93.6
50 to 99 employees -----	E1	96	6.6	159.4	3.5	8.6	60.7	345.8	196.2	541.1	15.8	115.9
100 to 249 employees -----	E1	79	12.2	339.9	5.8	11.7	115.8	779.0	403.9	1 166.6	41.4	338.8
250 to 499 employees -----	E1	33	11.3	298.6	5.6	11.7	101.1	722.6	312.7	1 000.2	34.5	289.1
500 to 999 employees -----	-	12	8.0	260.2	3.7	7.7	84.5	539.2	271.5	799.9	61.3	219.4
1,000 to 2,499 employees -----	-	19	38.3	1 199.0	20.8	43.0	559.1	2 228.5	1 251.4	3 493.6	134.3	770.3
2,500 employees or more -----	-	2	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Covered by administrative records ² -----	E9	479	3.8	81.5	2.0	3.9	33.7	179.0	80.4	259.4	8.0	50.1
INDUSTRY 3826, ANALYTICAL INSTRUMENTS												
Total -----	E1	562	31.2	892.9	13.5	26.7	287.3	2 107.1	1 363.2	3 468.2	125.5	781.2
Establishments with an average of—												
1 to 4 employees -----	E9	200	.4	8.8	.2	.4	3.7	21.6	11.4	33.0	.9	8.3
5 to 9 employees -----	E9	93	.6	14.7	.3	.6	6.3	34.8	19.0	53.0	1.3	14.5
10 to 19 employees -----	E5	62	.9	22.8	.4	.8	8.1	51.5	24.6	76.4	2.2	15.4
20 to 49 employees -----	E2	87	2.8	75.7	1.4	2.8	30.1	173.6	79.9	253.7	6.9	54.9
50 to 99 employees -----	E2	52	3.7	104.9	1.6	3.2	34.2	256.2	127.1	383.4	10.5	96.2
100 to 249 employees -----	E1	34	5.2	151.2	2.2	4.5	46.6	323.9	248.7	573.2	20.1	138.2
250 to 499 employees -----	-	24	8.4	232.7	3.5	6.8	71.5	584.6	332.9	923.3	24.0	210.7
500 to 999 employees -----	-	7	5.2	163.3	2.0	4.0	48.3	329.0	240.9	561.7	27.5	134.9
1,000 to 2,499 employees -----	-	3	4.0	118.8	1.9	3.5	38.4	331.8	278.6	610.5	32.0	108.0
Covered by administrative records ² -----	E9	299	1.4	30.4	.7	1.4	12.7	70.7	37.4	108.1	3.0	27.5
INDUSTRY 3827, OPTICAL INSTRUMENTS AND LENSES												
Total -----	-	250	20.1	581.6	11.3	21.9	260.8	1 167.8	694.7	1 863.6	83.3	610.2
Establishments with an average of—												
1 to 4 employees -----	E6	48	.1	2.2	.1	.1	1.0	7.7	3.7	11.3	.2	2.0
5 to 9 employees -----	E7	34	.2	5.8	.1	.2	2.2	18.0	8.1	26.1	.7	6.4
10 to 19 employees -----	E5	41	.6	14.3	.3	.6	6.2	27.5	16.1	46.2	1.5	10.0
20 to 49 employees -----	E1	56	1.8	46.0	1.1	2.1	23.7	95.6	43.9	138.0	4.2	27.7
50 to 99 employees -----	E1	29	1.9	54.1	1.2	2.4	25.1	94.6	70.9	171.5	4.6	50.9
100 to 249 employees -----	-	22	3.3	86.7	1.9	3.7	38.5	160.3	113.7	278.8	12.2	56.4
250 to 499 employees -----	-	8	2.5	67.3	1.4	2.8	35.5	121.2	86.2	205.4	14.2	75.4
500 to 999 employees -----	-	11	9.6	305.2	5.3	10.1	128.6	642.8	352.2	986.4	45.6	381.3
1,000 to 2,499 employees -----	-	1	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Covered by administrative records ² -----	E9	96	.7	15.4	.3	.6	5.8	35.7	19.5	55.2	1.5	14.2

See footnotes at end of table.

Table 4. Industry Statistics by Employment Size of Establishment: 1987—Con.

[For meaning of abbreviations and symbols, see introductory text. For explanation of terms, see appendixes]

Industry and employment size class	E ¹	All establishments (no.)	All employees		Production workers			Value added by manufacture (million dollars)	Cost of materials (million dollars)	Value of shipments (million dollars)	New capital expenditures (million dollars)	End-of-year inventories (million dollars)
			Number (1,000)	Payroll (million dollars)	Number (1,000)	Hours (millions)	Wages (million dollars)					
INDUSTRY 3829, MEASURING AND CONTROLLING DEVICES, N.E.C.												
Total -----	-	971	41.0	1 098.8	20.2	39.8	413.9	2 259.0	1 228.1	3 442.0	104.0	928.0
Establishments with an average of—												
1 to 4 employees -----	E8	359	.6	12.6	.4	.7	5.3	27.4	14.3	41.8	.9	9.5
5 to 9 employees -----	E7	162	1.1	24.3	.6	1.2	10.3	53.7	30.3	83.8	1.5	18.4
10 to 19 employees -----	E5	146	2.0	48.1	1.1	2.1	19.6	101.2	55.6	158.2	3.1	32.1
20 to 49 employees -----	E2	147	4.6	116.5	2.5	4.9	49.1	230.9	131.9	371.1	8.1	83.3
50 to 99 employees -----	E1	68	4.7	117.4	2.5	4.9	47.1	239.7	152.1	387.4	6.6	98.9
100 to 249 employees -----	-	63	10.0	268.1	5.3	10.4	106.6	563.2	344.9	904.4	25.9	236.2
250 to 499 employees -----	-	15	4.9	139.7	2.2	4.4	42.6	299.0	145.3	441.7	16.8	93.2
500 to 999 employees -----	-	6	4.4	137.8	2.2	3.6	48.9	316.2	195.4	468.9	17.0	186.7
1,000 to 2,499 employees -----	-	4	8.7	234.3	3.6	7.5	84.4	427.6	158.3	584.6	24.2	169.5
2,500 employees or more -----	-	1	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Covered by administrative records ² -----	E9	481	2.3	45.4	1.3	2.5	18.8	90.6	47.4	138.1	3.1	31.9

Note: For qualifications of data, see footnotes on table 1a-1. Data shown as a (D) are included in underscored figures above.

¹Payroll and sales data for some small single unit companies with up to 20 employees (cutoff varied by industry) were obtained from administrative records of other Government agencies rather than from census report forms. These data were then used in conjunction with industry averages to estimate the items shown for these small establishments. This technique was also used for a small number of other establishments whose reports were not received at the time data were tabulated. The following symbols are shown for those employment-size classes where estimated data based on administrative-record data account for 10 percent or more of figures shown: E1—10 to 19 percent; E2—20 to 29 percent; E3—30 to 39 percent; E4—40 to 49 percent; E5—50 to 59 percent; E6—60 to 69 percent; E7—70 to 79 percent; E8—80 to 89 percent; E9—90 percent or more.

²Report forms were not mailed to small single unit companies with up to 20 employees (cutoff varied by industry). Payroll and sales data for 1987 were obtained from administrative records supplied by other agencies of the Federal Government. Those data were then used in conjunction with industry averages to estimate the items shown. Data are also included in respective employment-size classes shown.

Table 5a. Industry Statistics by Industry and Primary Product Class Specialization: 1987

[Table presents selected statistics for establishments according to their degree of specialization in products primary to their industry. Measures of plant specialization shown are (1) industry specialization: ratio of primary product shipments to total product shipments (primary plus secondary, excluding miscellaneous receipts) for the establishment; and (2) product class specialization: ratio of largest primary product class shipments to total product shipments (primary plus secondary, excluding miscellaneous receipts) for the establishment. See appendix for method of computing ratios. For meaning of abbreviations and symbols, see introductory text. For explanation of terms, see appendixes]

Industry or product class code	Industry or primary product class	All establishments (number)	All employees		Production workers			Value added by manufacture (million dollars)	Cost of materials (million dollars)	Value of shipments (million dollars)	New capital expenditures (million dollars)
			Number (1,000)	Payroll (million dollars)	Number (1,000)	Hours (millions)	Wages (million dollars)				
3812	Search and navigation equipment: All establishments in industry -----	1 084	369.4	12 373.0	158.7	314.3	4 466.2	24 738.7	12 208.3	36 266.8	1 439.1
38121	Establishments with this product class primary: Aeronautical, nautical, and navigational instruments, not sending or receiving radio signals -----	85	20.9	593.7	11.4	23.2	261.7	1 230.2	603.0	1 823.1	77.6
38122	Search, detection, navigation, and guidance systems and equipment -----	261	335.7	11 458.4	140.9	278.5	4 071.4	22 882.5	11 293.0	33 505.8	1 325.2
3821	Laboratory apparatus and furniture: All establishments in industry -----	260	17.1	440.9	9.6	19.2	195.2	1 142.4	639.8	1 769.3	52.3
3822	Environmental controls: All establishments in industry -----	254	26.5	602.4	18.6	36.2	357.3	1 302.7	759.9	2 068.8	66.3
3823	Process control instruments: All establishments in industry -----	785	53.4	1 476.5	26.7	53.3	560.1	3 205.2	1 601.4	4 788.9	129.3
3824	Fluid meters and counting devices: All establishments in industry -----	158	10.1	237.1	6.5	12.7	119.9	566.5	381.2	938.6	34.9
38242	Establishments with this product class primary: Integrating and totalizing meters for gas and liquids --	29	5.4	137.0	3.4	6.8	72.5	363.5	225.5	587.7	26.3
38243	Counting devices -----	24	2.3	54.1	1.4	3.0	24.8	117.9	65.2	178.7	3.7
38244	Motor vehicle instruments -----	13	1.6	28.4	1.2	1.9	13.6	49.1	64.7	110.1	3.4
3825	Instruments to measure electricity: All establishments in industry -----	930	85.2	2 476.7	43.9	91.4	1 005.4	5 090.9	2 662.4	7 703.3	307.5
38251	Establishments with this product class primary: Integrating instruments, electrical -----	13	5.6	134.6	4.4	9.2	92.4	325.5	126.9	443.8	15.6
38252	Test equipment for testing electrical, radio and communication circuits, and motors -----	302	64.7	1 988.5	31.3	66.0	757.8	4 029.4	2 167.2	6 151.4	258.0
38253	Instruments to measure electricity, n.e.c. -----	54	8.7	213.5	4.9	10.0	98.2	440.6	228.7	669.7	19.4
3826	Analytical instruments: All establishments in industry -----	562	31.2	892.9	13.5	26.7	287.3	2 107.1	1 363.2	3 468.2	125.5
3827	Optical instruments and lenses: All establishments in industry -----	250	20.1	581.6	11.3	21.9	260.8	1 167.8	694.7	1 863.6	83.3
38271	Establishments with this product class primary: Sighting, tracking, and fire control equipment, optical type -----	28	6.4	170.5	3.6	6.9	86.7	411.3	249.2	623.8	25.9
38272	Binoculars and astronomical instruments -----	7	.3	6.2	.1	.3	3.1	7.5	14.0	26.9	.6
38273	Optical instruments and lenses, n.e.c. -----	112	12.5	383.7	7.1	13.8	162.1	703.1	407.4	1 142.1	54.8

See footnotes at end of table.

Table 5a. Industry Statistics by Industry and Primary Product Class Specialization: 1987—
Con.

[Table presents selected statistics for establishments according to their degree of specialization in products primary to their industry. Measures of plant specialization shown are (1) industry specialization: ratio of primary product shipments to total product shipments (primary plus secondary, excluding miscellaneous receipts) for the establishment; and (2) product class specialization: ratio of largest primary product class shipments to total product shipments (primary plus secondary, excluding miscellaneous receipts) for the establishment. See appendix for method of computing ratios. For meaning of abbreviations and symbols, see introductory text. For explanation of terms, see appendixes]

Industry or product class code	Industry or primary product class	All establishments (number)	All employees		Production workers			Value added by manufacture (million dollars)	Cost of materials (million dollars)	Value of shipments (million dollars)	New capital expenditures (million dollars)
			Number (1,000)	Payroll (million dollars)	Number (1,000)	Hours (millions)	Wages (million dollars)				
3829	Measuring and controlling devices, n.e.c.: All establishments in industry	971	41.0	1 098.8	20.2	39.8	413.9	2 259.0	1 228.1	3 442.0	104.0
	Establishments with this product class primary:										
38291	Aircraft engine instruments, except flight	19	6.5	158.4	2.5	5.4	54.0	317.9	145.0	432.4	12.7
38292	Physical properties and kinematic testing and inspection equipment	150	9.7	280.4	4.9	9.3	109.3	585.3	318.9	903.4	21.3
38294	Nuclear radiation detection and monitoring instruments	49	8.3	246.4	3.6	6.7	70.3	491.2	294.6	776.1	32.7
38295	Commercial, geophysical, meteorological, and general purpose instruments and equipment	113	10.3	274.4	5.9	11.7	121.9	538.3	286.2	824.0	23.3
38296	Surveying and drafting instruments and associated equipment	28	2.5	60.9	1.4	2.7	25.5	173.0	98.4	268.1	8.2

Note: For qualifications of data, see footnotes on table 1a-1.

Table 5b. Industry-Product Analysis—Value of Shipments and Primary Product Shipments and Specialization and Coverage Ratios for the Industry: 1987 and Earlier Census Years

[An establishment is assigned to an industry based on shipment values of products representing largest amount considered primary to an industry. Frequently, establishment shipments comprise mixtures of products assigned to an industry (primary), those considered primary to other industries (secondary), and receipts for activities such as merchandising or contract work. Columns A-D show this product pattern for an industry, and column E shows primary product specialization ratio. The extent to which an industry's primary products are shipped by establishments classified in and out of an industry is shown in columns F-H and coverage ratio is shown in column I. For meaning of abbreviations and symbols, see introductory text. For explanation of terms, see appendixes]

Industry and product group code	Industry and census year	Value of shipments					Value of primary product shipments			
		Total (million dollars)	Primary products (million dollars)	Secondary products (million dollars)	Miscellaneous receipts (million dollars)	Primary product specialization ratio col. B ÷ col. B + C (percent)	Total made in all industries (million dollars)	Made in this industry (million dollars)	Made in other industries (million dollars)	Coverage ratio col. B ÷ col. F (percent)
		A	B	C	D	E	F	G	H	I
3812	Search and navigation equipment	36 266.8	30 632.7	3 909.9	1 724.2	89	34 016.9	30 632.7	3 384.2	90
3821	Laboratory apparatus and furniture	1 769.3	1 482.9	174.8	111.6	89	1 618.8	1 482.9	135.9	92
3822	Environmental controls	1987..	2 068.8	1 796.7	147.5	92	2 024.6	1 796.7	227.9	89
		1982..	1 549.1	1 386.1	119.1	92	1 544.5	1 386.1	158.4	90
		1977..	1 358.7	1 017.7	261.6	80	1 106.4	1 017.7	88.7	92
3823	Process control instruments	1987..	4 788.9	4 039.2	367.1	92	4 371.5	4 039.2	332.3	92
		1982..	4 005.8	3 390.4	347.6	91	3 915.1	3 390.4	524.7	87
		1977..	2 022.0	1 641.5	192.5	90	2 061.1	1 641.5	419.6	80
3824	Fluid meters and counting devices	1987..	938.6	861.7	46.7	95	1 133.1	861.7	271.4	76
		1982..	726.7	663.6	45.5	94	787.1	663.6	123.4	84
		1977..	650.4	507.7	125.1	80	634.3	507.7	126.6	80
3825	Instruments to measure electricity	1987..	7 703.3	6 972.9	345.6	95	7 612.3	6 972.9	639.4	92
		1982..	6 120.1	5 058.2	308.6	94	5 575.6	5 058.2	517.4	91
		1977..	2 761.0	2 276.4	254.4	90	2 566.2	2 276.4	289.8	89
3826	Analytical instruments	1987..	3 468.2	2 844.0	441.5	87	3 156.6	2 844.0	312.6	90
3827	Optical instruments and lenses	1987..	1 863.6	1 595.7	161.7	91	1 990.2	1 595.7	394.5	80
3829	Measuring and controlling devices, n.e.c.	1987..	3 442.0	2 723.5	428.7	86	3 389.3	2 723.5	665.8	80

Table 6a-1. Product and Product Classes—Value of Shipments by All Producers: 1987 and 1982

[Includes value of products of this industry produced by (1) establishments classified in this industry (primary) and (2) establishments classified in other industries (secondary). Transfers of products of this industry from one establishment of the same company (interplant transfers) are also included. For further explanation, see Value of Shipments in appendixes. For comparability of product classes and product codes between 1982 and 1987, see appendixes. For meaning of abbreviations and symbols, see introductory text.]

1987 product code	Product	1987		1982	
		Number of companies with shipments of \$100,000 or more	Value of product shipments ¹ (million dollars)	Number of companies with shipments of \$100,000 or more	Value of product shipments ¹ (million dollars)
3812- --	SEARCH, DETECTION, NAVIGATION, GUIDANCE, AERONAUTICAL AND NAUTICAL SYSTEMS, INSTRUMENTS, AND EQUIPMENT				
	Total -----	(NA)	²34 016.9	(NA)	(²)
38121 --	Aeronautical, nautical, and navigational instruments, not sending or receiving radio signals (excluding engine instruments):				
38121 00	Aeronautical, nautical, and navigational instruments, not sending or receiving radio signals, (excluding engine instruments) (for additional detail, see Current Industrial Report MA-38B, Selected Instruments and Related Products) -----	129	2 267.6	124	³ 1 418.7
38122 --	Search, detection, navigation, and guidance systems and equipment:				
38122 00	Search, detection, navigation, and guidance systems and equipment (for additional detail, see Current Industrial Report MA-36P, Communication Equipment, Including Telephone and Telegraph Equipment) -----	244	30 886.3	(NA)	(⁴)
38120 --	Search, detection, navigation, guidance, aeronautical, and nautical systems, instruments, and equipment, n.s.k. -----	(NA)	⁵ 863.0	(NA)	(²)
38120 00	Search, detection, navigation, guidance, aeronautical and nautical systems, instruments, and equipment, n.s.k., typically for establishments with 10 employees or more (see note) -----	(NA)	⁵ 715.2	(NA)	(²)
38120 02	Search, detection, navigation, guidance, aeronautical and nautical systems, instruments, and equipment, n.s.k., typically for establishments with less than 10 employees (see note) -----	(NA)	⁵ 147.8	(NA)	(²)
3821- --	LABORATORY APPARATUS AND FURNITURE				
	Total -----	(NA)	1 618.8	(NA)	(⁶)
38210 --	Laboratory apparatus and furniture -----	(NA)	1 618.8	(NA)	(⁶)
38210 10	Laboratory apparatus (for additional detail, see Current Industrial Report MA-38B, Selected Instruments and Related Products) -----	208	1 303.0	239	⁷ 1 083.6
38210 20	Laboratory furniture and parts sold separately (for additional detail, see Current Industrial Report MA-38B, Selected Instruments and Related Products) -----	30	268.6	(NA)	(⁸)
38210 00	Laboratory apparatus and furniture, n.s.k., typically for establishments with 10 employees or more (see note) -----	(NA)	15.3	(NA)	(⁶)
38210 02	Laboratory apparatus and furniture, n.s.k., typically for establishments with less than 10 employees (see note) -----	(NA)	31.9	(NA)	(⁶)
3822- --	ENVIRONMENTAL CONTROLS				
	Total -----	(NA)	2 024.6	(NA)	1 544.5
38220 --	Automatic controls for regulating residential and commercial environments and appliances:				
38220 00	Automatic controls for regulating residential and commercial environments and appliances used as components of air-conditioning, refrigeration, and comfort heating (including pneumatic controls) (for additional detail, see Current Industrial Report MA-38B, Selected Instruments and Related Products) -----	129	1 957.4	153	1 512.3
38220 02	Automatic controls for regulating residential and commercial environments and appliances, n.s.k., typically for establishments with less than 20 employees (see note) -----	(NA)	67.2	(NA)	32.2
3823- --	PROCESS CONTROL INSTRUMENTS				
	Total -----	(NA)	4 371.5	(NA)	3 915.1
38230 --	Process control instruments:				
38230 00	Process control instruments (for additional detail, see Current Industrial Report MA-38B, Selected Instruments and Related Products) -----	475	4 185.2	589	3 814.2
38230 02	Process control instruments, n.s.k., typically for establishments with less than 20 employees (see note) -----	(NA)	186.4	(NA)	100.9
3824- --	FLUID METERS AND COUNTING DEVICES				
	Total -----	(NA)	1 133.1	(NA)	787.1
38242 --	Integrating and totalizing meters for gas and liquids:				
38242 00	Integrating and totalizing meters for gas and liquids (for additional detail, see Current Industrial Report MA-38B, Selected Instruments and Related Products) -----	54	609.0	60	519.6
38243 --	Counting devices:				
38243 00	Counting devices, excluding motor vehicle instruments (for additional detail, see Current Industrial Report MA-38B, Selected Instruments and Related Products) -----	51	219.3	42	162.0
38244 --	Motor vehicle instruments:				
38244 00	Motor vehicle instruments (for additional detail, see Current Industrial Report MA-38B, Selected Instruments and Related Products) -----	30	241.2	(NA)	76.2

See footnotes at end of table.

Table 6a-1. Product and Product Classes—Value of Shipments by All Producers: 1987 and 1982—Con.

[Includes value of products of this industry produced by (1) establishments classified in this industry (primary) and (2) establishments classified in other industries (secondary). Transfers of products of this industry from one establishment of the same company (interplant transfers) are also included. For further explanation, see Value of Shipments in appendixes. For comparability of product classes and product codes between 1982 and 1987, see appendixes. For meaning of abbreviations and symbols, see introductory text.]

1987 product code	Product	1987		1982	
		Number of companies with shipments of \$100,000 or more	Value of product shipments ¹ (million dollars)	Number of companies with shipments of \$100,000 or more	Value of product shipments ¹ (million dollars)
3824- --	FLUID METERS AND COUNTING DEVICES—Con.				
38240 --	Fluid meters and counting devices, n.s.k.	(NA)	63.6	(NA)	29.3
38240 00	Fluid meters and counting devices, n.s.k., typically for establishments with 20 employees or more (see note)	(NA)	31.7	(NA)	11.8
38240 02	Fluid meters and counting devices, n.s.k., typically for establishments with less than 20 employees (see note)	(NA)	31.9	(NA)	17.5
3825- --	INSTRUMENTS TO MEASURE ELECTRICITY				
	Total	(NA)	7 612.3	(NA)	5 575.6
38251 --	Integrating instruments, electrical:				
38251 00	Integrating instruments, electrical (for additional detail, see Current Industrial Report MA-38B, Selected Instruments and Related Products) ..	23	399.8	30	363.2
38252 --	Test equipment for testing electrical, radio and communication circuits, and motors:				
38252 00	Test equipment for testing electrical, radio, and communication circuits, and motors (for additional detail, see Current Industrial Report MA-38B, Selected Instruments and Related Products)	402	6 116.8	312	4 455.2
38253 --	Instruments to measure electricity, n.e.c.:				
38253 00	Instruments to measure electricity, n.e.c. (for additional detail, see Current Industrial Report MA-38B, Selected Instruments and Related Products) ..	98	671.0	126	556.7
38250 --	Instruments to measure electricity, n.s.k.	(NA)	424.7	(NA)	200.5
38250 00	Instruments to measure electricity, n.s.k., typically for establishments with 10 employees or more (see note)	(NA)	163.1	(NA)	102.1
38250 02	Instruments to measure electricity, n.s.k., typically for establishments with less than 10 employees (see note)	(NA)	261.6	(NA)	98.4
3826- --	ANALYTICAL INSTRUMENTS				
	Total	(NA)	⁹3 156.6	(NA)	(⁹)
38260 --	Analytical and scientific instruments, except optical:				
38260 00	Analytical and scientific instruments, except optical (for additional detail, see Current Industrial Report MA-38B, Selected Instruments and Related Products)	282	¹⁰ 3 050.0	(NA)	⁹ 2 088.4
38260 02	Analytical and scientific instruments, except optical, n.s.k., typically for establishments with less than 5 employees (see note)	(NA)	¹⁰ 106.6	(NA)	(⁹)
3827- --	OPTICAL INSTRUMENTS AND LENSES				
	Total	(NA)	¹¹1 990.2	(NA)	(¹¹)
38271 --	Sighting, tracking, and fire control equipment, optical type:				
38271 00	Sighting, tracking, and fire control equipment, optical type (for additional detail, see Current Industrial Report MA-38B, Selected Instruments and Related Products)	59	729.4	53	¹² 505.4
38272 --	Binoculars and astronomical instruments:				
38272 00	Binoculars and astronomical instruments (for additional detail, see Current Industrial Report MA-38B, Selected Instruments and Related Products) ..	15	36.3	170	¹³ 922.8
38273 --	Optical instruments and lenses, n.e.c. (for additional detail, see Current Industrial Report MA-38B, Selected Instruments and Related Products) ..	159	1 169.6		
38270 --	Optical instruments and lenses, n.s.k.	(NA)	54.8	(NA)	(¹¹)
38270 00	Optical instruments and lenses, n.s.k., typically for establishments with 10 employees or more (see note)	-	-	(NA)	(11)
38270 02	Optical instruments and lenses, n.s.k., typically for establishments with less than 10 employees (see note)	(NA)	54.8		
3829- --	MEASURING AND CONTROLLING DEVICES, N.E.C.				
	Total	(NA)	¹⁴3 389.3	(NA)	(¹⁴)
38291 --	Aircraft engine instruments, except flight:				
38291 00	Aircraft engine instruments, except flight (for additional detail, see Current Industrial Report MA-38B, Selected Instruments and Related Products) ..	49	510.1	42	311.0
38292 --	Physical properties and kinematic testing and inspection equipment:				
38292 00	Physical properties and kinematic testing and inspection equipment (for additional detail, see Current Industrial Report MA-38B, Selected Instruments and Related Products)	196	906.4	199	635.2
38294 --	Nuclear radiation detection and monitoring instruments:				
38294 00	Nuclear radiation detection and monitoring instruments (for additional detail, see Current Industrial Report MA-38B, Selected Instruments and Related Products)	61	645.0	71	596.4

See footnotes at end of table.

Table 6a-1. Product and Product Classes—Value of Shipments by All Producers: 1987 and 1982—Con.

[Includes value of products of this industry produced by (1) establishments classified in this industry (primary) and (2) establishments classified in other industries (secondary). Transfers of products of this industry from one establishment of the same company (interplant transfers) are also included. For further explanation, see Value of Shipments in appendixes. For comparability of product classes and product codes between 1982 and 1987, see appendixes. For meaning of abbreviations and symbols, see introductory text.]

1987 product code	Product	1987		1982	
		Number of companies with shipments of \$100,000 or more	Value of product shipments ¹ (million dollars)	Number of companies with shipments of \$100,000 or more	Value of product shipments ¹ (million dollars)
3829--	MEASURING AND CONTROLLING DEVICES, N.E.C.—Con.				
38295 --	Commercial, geophysical, meteorological, and general-purpose instruments and equipment -----	(NA)	891.5	(NA)	(NA)
38295 10	Commercial, geophysical, meteorological, and general-purpose instruments (for additional detail, see Current Industrial Report MA-38B, Selected Instruments and Related Products) -----	123	374.7	146	¹⁵ 365.2
38295 20	Meteorological and geophysical electronic equipment (for additional detail, see Current Industrial Report MA-36P, Communication Equipment, Including Telephone and Telegraph Equipment) -----	52	497.4	(NA)	(¹⁶)
38295 00	Commercial, geophysical, meteorological, and general-purpose instruments and equipment, n.s.k. -----	(NA)	19.4	(NA)	(NA)
38296 --	Surveying and drafting instruments and associated equipment: Surveying and drafting instruments and apparatus, including photogrammetric equipment (for additional detail, see Current Industrial Report MA-38B, Selected Instruments and Related Products) -----	45	230.2	(NA)	(¹⁷)
38296 00	Surveying and drafting instruments and apparatus, including photogrammetric equipment (for additional detail, see Current Industrial Report MA-38B, Selected Instruments and Related Products) -----	(NA)	206.2	(NA)	(¹⁴)
38290 --	Measuring and controlling devices, n.e.c., n.s.k. -----	(NA)	64.6	(NA)	(¹⁴)
38290 00	Measuring and controlling devices, n.e.c., n.s.k., typically for establishments with 10 employees or more (see note) -----	(NA)	141.6	(NA)	(¹⁴)
38290 02	Measuring and controlling devices, n.e.c., n.s.k., typically for establishments with less than 10 employees (see note) -----	(NA)		(NA)	(¹⁴)

Note: In 1987 Census of Manufactures, data for establishments of small single unit companies with up to 20 employees were estimated from administrative-record data rather than data actually collected from respondents. Employment cutoffs used for administrative records for each industry and shipments figures are included in code ending with "002". In both 1987 and 1982 Censuses of Manufactures, products not completely identified on standard forms were coded in appropriate product class (five-digit) followed by "00" or to appropriate product group code (four-digit) followed by "000".

¹Data reported by all producers, not just those with shipments of \$100,000 or more.

²SIC Industry 3812, Search and Navigation Equipment, is published as a separate industry for the first time in 1987. In 1982, data were included as part of old SIC Industries 3811, Engineering and Scientific Instruments, and 3662, Radio and Television Communication Equipment, and separate data are not available.

³In 1982, data for product code 38121 00 were published as part of old product code 38111 00.

⁴In 1982, data for product code 38122 00 were published as part of old product codes 36625 00 and 36629 00.

⁵Data include an indeterminable amount of laboratory apparatus and furniture (SIC 3821) and measuring and controlling devices, n.e.c., (SIC 3829) manufacturers that did not totally identify their products.

⁶SIC Industry 3821, Laboratory Apparatus and Furniture is published as a separate industry for the first time in 1987. In 1982, data were included as part of old SIC Industry 3811, Engineering and Scientific Instruments, and separate data are not available.

⁷In 1982, data for product code 38210 10 were published as old product code 38112 00.

⁸In 1982, data for product code 38210 20 were published as part of old product code 38113 00 and separate data are not available.

⁹SIC Industry 3826, Analytical Instruments, is published as a separate industry for the first time in 1987. In 1982, data were included as part of old SIC Industries 3811, Engineering and Scientific Instruments, and 3832, Optical Instruments and Lenses, and separate data are not available.

¹⁰Data include an indeterminable amount of optical instruments and lenses (SIC 3827) manufacturers that did not totally identify their products.

¹¹SIC Industry 3827, Optical Instruments and Lenses, is published as a separate industry for the first time in 1987. In 1982, data were included as part of old SIC Industry 3832, Optical Instruments and Lenses. Separate data are not available for 1982.

¹²In 1982, data for product code 38271 00 were published as old product code 38324 00.

¹³In 1982, data for product codes 38272 00 and 38273 00 were published as old product code 38325 00 and separate data are not available.

¹⁴SIC Industry 3829, Measuring and Controlling Devices, N.E.C., was redefined for 1987. In 1982, data were included as part of old SIC Industries 3829, Measuring and Controlling Devices, N.E.C.; 3662, Radio and Television Communication Equipment; and 3811, Engineering and Scientific Instruments, and separate data are not available.

¹⁵In 1982, data for product code 38295 10 were published as old product code 38293 00.

¹⁶In 1982, data for product code 38295 20 were published as part of old product code 36625 00 and separate data are not available.

¹⁷In 1982, data for product code 38296 00 were published as part of old product code 38113 00 and separate data are not available.

Table 6a-2. Related Products From Current Industrial Reports Series—Value of Shipments by All Producers: 1987 and 1982

[Additional detail is provided in the Current Industrial Report series. For meaning of abbreviations and symbols, see introductory text]

1987 product code	Product	1987 product shipments		1982 product shipments	
		Quantity	Value (million dollars)	Quantity	Value (million dollars)
	MA36P, COMMUNICATION EQUIPMENT, INCLUDING TELEPHONE, TELEGRAPH, AND OTHER ELECTRONIC SYSTEMS AND EQUIPMENT				
38122 --	Search and detection systems and navigation and guidance systems and equipment -----	(X)	30 910.9	(X)	17 313.8
38122 11	Light reconnaissance and surveillance electronic systems and equipment (infrared, ultraviolet, visible light), including bomber-defense, fire control (except optical), IR fuses, space satellite and other IR detection and warning systems, sniperscopes, snooperscopes, night driving equipment, mapping equipment, photographic equipment, wake detection, and electronic checkout, monitoring evaluation for light reconnaissance and surveillance electronic systems -----	(X)	2 739.9	(X)	1 641.1
38122 13	IFF equipment -----	(X)	226.9	(X)	94.0
38122 15	Proximity fuses -----	(X)	234.6	(X)	154.4

See footnotes at end of table.

Table 6a-2. Related Products From Current Industrial Reports Series—Value of Shipments by All Producers: 1987 and 1982—Con.

[Additional detail is provided in the Current Industrial Report series. For meaning of abbreviations and symbols, see introductory text]

1987 product code	Product	1987 product shipments		1982 product shipments	
		Quantity	Value (million dollars)	Quantity	Value (million dollars)
	MA36P, COMMUNICATION EQUIPMENT, INCLUDING TELEPHONE, TELEGRAPH, AND OTHER ELECTRONIC SYSTEMS AND EQUIPMENT—Con.				
38122 —	Search and detection systems and navigation and guidance systems and equipment—Con.				
	Radar systems and equipment:				
	Search, detection, and acquisition radar systems and equipment (BMEWS, airborne and other early warning radar, air traffic control radar, air defense and fighter control radar, ship radar, harbor control radar, meteorological radar, etc.)				
38122 17	Airborne and missile/space radar -----	(X)	1 249.0	(X)	934.5
38122 19	Ship (marine) radar -----	(X)	1 660.6	(X)	820.5
38122 21	Ground radar -----	(X)	841.8	(X)	686.5
	Tracking radar systems and equipment (fire control, bombing, bombing-navigational radar, aircraft and missile tracking radar, etc.):				
38122 23	Airborne and missile/space radar -----	(X)	1 561.5	(X)	1 046.8
38122 25	Ship (marine) radar -----	(X)	292.5	(X)	280.9
38122 27	Ground radar -----	(X)	1 046.4	(X)	451.4
	Instrumentation radar systems and equipment (altimeters, highway speed control radar, missile and space satellite tracking range radar, GCA and other precision approach radar, etc.):				
38122 29	Airborne, missile/space and ship (marine) radar -----	(X)	152.9	(X)	10.6
38122 31	Ground radar -----	(X)	49.0	(X)	90.8
38122 33	Electronic checkout, monitoring, evaluation, and other electronic support equipment for radar systems -----	(X)	479.9	(X)	267.0
	Sonar search, detection, tracking and communication systems and equipment, including ASW (sonar telephone communication equipment, depth finding, fire control, fusing, guidance, hydrophones, mapping, sonobuoys, navigation, sonar fish finders, sonar range instrumentation, and other):				
38122 35	Surface ship applications (destroyers, destroyer-escort etc.) -----	(X)	544.9	(X)	396.5
38122 37	Submarine applications -----	(X)	733.3	(X)	547.7
38122 39	Airborne -----	(X)	556.8	(X)	211.3
38122 41	Electronic checkout, monitoring, evaluation, and other electronic support equipment for sonar systems and submerged fixed systems -----	(X)	310.9	(X)	259.7
38122 43	Specialized command and control data processing in display equipment sold separately from complete systems -----	(X)	1 505.9	(X)	399.5
38122 45	Search, detection, identification, and tracking systems and equipment, n.e.c. -----	(X)	1 964.0	(X)	1 047.8
	Electronic warfare systems and equipment:				
	Countermeasures equipment:				
38122 47	Jamming equipment, communications, and radar -----	(X)	2 746.0	(X)	830.7
38122 49	Underwater countermeasures equipment -----	(X)		(X)	144.6
38122 51	Other active countermeasures equipment, excluding passive materials such as chaff, window, needles, rope, etc. -----	(X)	781.1	(X)	308.2
38122 53	Specialized electronic and communication intelligence equipment, including specially designed DF equipment signal reduction and processing equipment, and signal analyzers and display equipment -----	(X)	2 049.1	(X)	1 345.9
	Missile and space vehicle systems and equipment (beam riders, command guidance, inertial systems, infrared homing systems, radar systems, stellar trackers, television systems, combination systems, etc.):				
38122 55	Missile-borne and space-vehicle-borne equipment -----	(X)	4 169.4	(X)	1 867.2
38122 57	Nonmissile and space vehicle guidance equipment (ground, ship, or airborne command guidance systems, etc.) -----	(X)	540.7	(X)	394.6
38122 59	Electronic checkout, launching, and other missile and space vehicle support systems (ground, ship, and air) -----	(X)	654.5	(X)	392.5
	Navigation systems and equipment, navigational aids for aircraft, ship, and ground navigation (autopilots, beacons, transponders, collision warning devices, DECCA, DME, ILS, doppler navigation systems, inertial navigation systems, optical/laser loran, radio compasses and direction finders, SHORAN, TACAN, VOR, VORTAC equipment, etc.):				
	Airborne navigation systems:				
38122 61	Radio navigation receivers and displays (including OMNI, radio magnetic, glide slope/localizer, DME, etc.) -----	(X)	509.8	(X)	183.1
38122 63	Airborne integrated data systems/flight recorders -----	(X)	179.6	(X)	95.1
38122 65	Distance measuring equipment (DME) -----	(X)	52.0	(X)	53.9
38122 67	Flight directors/situation display -----	(X)	167.0	(X)	124.8
38122 69	Heads-up display (HUD) systems -----	(X)	147.2	(X)	121.0
38122 71	Inertial navigation systems -----	(X)	531.8	(X)	417.8
38122 73	Proximity warning/collision avoidance equipment -----	(X)		(X)	(1)
38122 75	Complete automatic pilots -----	(X)	170.9	(X)	1292.5
38122 77	Other airborne navigational systems -----	(X)	633.0	(X)	329.5
38122 79	Surface (ship and ground) navigational systems -----	(X)	333.2	(X)	390.6
38122 81	Underwater navigational systems -----	(X)		(X)	168.3
38122 83	Electronic checkout, monitoring, evaluation, and other electronic support equipment for navigational systems and equipment -----	(X)	1 095.0	(X)	512.5

See footnotes at end of table.

Table 6a-2. **Related Products From Current Industrial Reports Series—Value of Shipments by All Producers: 1987 and 1982—Con.**

[Additional detail is provided in the Current Industrial Report series. For meaning of abbreviations and symbols, see introductory text]

1987 product code	Product	1987 product shipments		1982 product shipments	
		Quantity	Value (million dollars)	Quantity	Value (million dollars)
	MA36P, COMMUNICATION EQUIPMENT, INCLUDING TELEPHONE, TELEGRAPH, AND OTHER ELECTRONIC SYSTEMS AND EQUIPMENT—Con.				
38295 — 38295 51	Meteorological and geophysical electronic equipment ----- Meteorological electronics equipment and radio astronomy equipment (automatic weather stations and weather tracking equipment, ceilometers, transitometers, space satellite meteorological systems, and specialized meteorological telemetering equipment -----	(X)	514.6	(X)	419.2
38295 59	Geophysical electronic equipment (exploration and other specialized geophysical equipment) -----	(X)	229.5	(X)	267.6
		(X)	222.1	(X)	351.6
38122 78	Electronic kits to be assembled by purchaser: Directional finders -----	(X)	(?)	(X)	(?)
	MA38B, SELECTED INSTRUMENTS AND RELATED PRODUCTS				
38121 —	Aeronautical, nautical, and navigational instruments, not sending or receiving radio signals, except aircraft engine instruments -----	(X)	2 269.7	(X)	1 404.7
	Flight and navigation sensors, transmitters, and displays:				
38121 01	Compasses (magnetic and gyroscopic) -----	(X)	80.5	(X)	101.7
38121 03	Radio navigation receivers and displays (including omni, radio magnetic, glide slope/localizer, DME, etc.) -----	(X)	73.2	(X)	80.9
38121 08	Altimeters, except radio and radar altimeters -----	(X)	50.7	(X)	55.3
38121 10	Airspeed indicators, including machmeters and air data computers -----	(X)	258.4	(X)	143.6
38121 12	Acceleration indicators and systems components ----- thousands..	(D)	(D)	(D)	(D)
38121 13	Rate-of-climb indicators ----- do..	18.3	13.1	36.5	17.2
38121 15	Angle-of-attack indicators ----- do..	2.8	9.2	4.7	10.1
38121 17	Bank and turn indicators ----- do..	(D)	(D)	(D)	(D)
38121 18	Artificial horizon flight instruments ----- do..	19.8	54.5	28.4	26.3
38121 20	Other aerospace and navigational instruments -----	(X)	445.6	(X)	195.3
	Gyroscopes sold separately:				
38121 21	Vertical ----- thousands..	8.7	27.2	4.6	16.4
38121 23	Directional ----- do..	25.9	60.0	34.1	45.1
38121 25	Free, torqued and untorqued -----	(X)	75.5	(X)	85.0
38121 26	Rate, inertial grade -----	(X)	120.3	(X)	50.4
38121 28	Rate, noninertial grade -----				
	Airframe equipment instruments:				
38121 61	Position indicators (mechanical, as for landing gear, cowl flaps, stabilizers, etc.) -----	(X)	21.8	(X)	13.2
38121 63	Hydraulic system (both electrical and mechanical measuring means, as for liquid level and temperature and pressure indicators) -----	(X)	45.9	(X)	25.9
38121 64	Cabin environmental measuring and control instrument (air-conditioning and heating, cabin pressure, oxygen, etc.) -----	(X)	42.1	(X)	50.0
38121 77	Thermocouple and thermocouple lead wire (aircraft type only) -----	(X)	(D)	(X)	402.1
38121 80	Other aerospace flight instruments -----	(X)	414.6		
38121 85	Nautical instruments (all types, including temperature, speed, pitch, and roll instruments and system components, etc.) ----- thousands..	874.6	88.1	450.6	56.6
38121 89	Parts and components for aeronautical, nautical, and navigational instruments, except aircraft engine instruments (sold separately) -----	(X)	97.3	(X)	(NA)
38210 —	Laboratory and scientific apparatus and laboratory furniture -----	(X)	1 549.1	(X)	(NA)
	Laboratory balances and scales:				
38210 11	Sensitivity of 5 centigrams or better ----- thousands..				
38210 13	Sensitivity of less than 5 centigrams ----- do..	953.9	52.8	946.1	50.4
38210 15	Laboratory furnaces and ovens -----	(X)	35.2	(X)	32.7
	Laboratory centrifuges:				
38210 17	Table-top type ----- thousands..	25.0	34.6	17.2	29.9
	Floor type:				
38210 18	Refrigerated ----- thousands..				
38210 20	Other ----- do..	14.0	92.6	12.2	70.9
38210 27	Laboratory evaporation and distillation apparatus -----	(X)	15.7	(X)	17.7
38210 28	Laboratory sterilizers and autoclaves -----	(X)	33.7	(X)	18.5
38210 29	Laboratory burners and hot plates -----	(X)	8.0		
38210 31	Laboratory granulators, mills, and other particle size reduction apparatus -----	(X)	2.2	(X)	2.2
38210 33	Laboratory dryers -----	(X)	4.0	(X)	2.7
38210 35	Laboratory blenders, mixers, shakers, dispensers, fraction collectors, and other liquid sample preparation apparatus -----	(X)	55.9	(X)	48.4
38210 36	Laboratory incubators ----- thousands..	12.7	37.8	5.5	18.4
38210 38	Laboratory freezers ----- do..	10.0	27.7	1.6	16.3
38210 42	Microtomes ----- do..	1.9	4.4	(NA)	(NA)
38210 81	Laboratory furniture, including cabinets, cases, benches, tables, stools, and reagent shelves, etc. -----	(X)	266.0	(X)	135.2
38210 88	Parts and components for laboratory furniture -----			(X)	(NA)
38210 98	All other laboratory and scientific apparatus not specified above (including wet and dry baths, melting point apparatus, etc., excluding analytical instruments) -----	(X)	556.6	(X)	415.3
38210 99	Components, parts and accessories for laboratory and scientific apparatus (sold separately) -----	(X)	321.8	(X)	304.6

See footnotes at end of table.

Table 6a-2. Related Products From Current Industrial Reports Series—Value of Shipments by All Producers: 1987 and 1982—Con.

[Additional detail is provided in the Current Industrial Report series. For meaning of abbreviations and symbols, see introductory text]

1987 product code	Product	1987 product shipments		1982 product shipments	
		Quantity	Value (million dollars)	Quantity	Value (million dollars)
	MA38B, SELECTED INSTRUMENTS AND RELATED PRODUCTS—Con.				
38220 --	Automatic controls for regulating residential and commercial environments and appliances -----	(X)	2 092.7	(X)	1 439.5
	Automatic controls principally used as components of air conditioning, refrigeration, and comfort heating (including pneumatic controls):				
	Temperature responsive (thermostats):				
38220 21	Electric ----- thousands-----	46 587.4	379.7	32 693.0	196.4
38220 22	Pneumatic ----- do-----	14 161.4	99.7	29 360.6	108.2
38220 25	Pressure responsive (pressurstats) ----- do-----	9 133.7	67.4	14 420.2	58.5
38220 30	Hydronic responsive ----- do-----				
38220 35	Humidity responsive (humidistats) ----- do-----	3 447.2	47.0	1 345.0	23.4
38220 40	Light responsive ----- do-----				
38220 45	Electrostatic responsive ----- do-----				
38220 50	Liquid level ----- do-----	1 392.0	9.5	672.9	3.0
38220 55	Defrost controls (except appliance regulators) ----- do-----				
38220 60	Igniters ----- do-----				
38220 65	Inherent motor protectors ----- do-----	98 280.2	152.7	66 362.8	73.2
38220 66	Microprocessor-based load programmers for building energy control ----- do-----	102.7	49.1	432.2	16.6
	Computerized energy control systems for buildings:				
38220 67	Less than 100 points (systems) ----- thousands-----				
38220 68	100 to 199 points (systems) ----- do-----	40.3	340.5	(NA)	27.5
38220 69	200 or more points ----- do-----				
38220 71	Upgrades or additions to existing computerized energy control systems for buildings (value only) ----- do-----	(NA)	294.2	(X)	-
38220 74	Other ----- thousands-----			50 793.4	556.6
	Controls for major appliances, such as domestic laundry and cooking appliances, refrigerators and freezers, vending machines, air-conditioners, etc.:				
38220 75	Temperature responsive ----- thousands-----	118 527.7	255.7	109 444.0	275.6
38220 77	Hydraulic and pneumatic ----- do-----				
38220 78	Pressure responsive ----- do-----	72 187.9	230.5	14 558.2	58.9
38220 81	All other controls for appliances ----- do-----				
38220 98	Parts and components for controls for monitoring residential and commercial environments and appliance regulating controls (sold separately) -----	(X)	166.8	(X)	41.6
38230 --	Process control instruments -----	(X)	4 083.6	(X)	3 750.8
	Industrial type instruments and related products primarily designed to measure, transmit, display, and/or control process variables in manufacturing, mining, energy conversion and public utilities. General purpose control system instruments (commonly called receiver-type), operating from standardized transmission signals (electrical types ac or dc milliampere, millivolt, or telemetering signals; pneumatic types, 3 to 15 and 3 to 27 psi signals):				
	Electronic systems, unified architecture type:				
38230 35	Controllers (recording, indicating, or blind) ----- thousands-----	204.4	105.7	711.7	131.4
38230 36	Recorders, with or without self-contained set-point stations ----- do-----	69.9	91.7	58.3	72.5
38230 37	Indicators, with or without self-contained set-point stations ----- do-----	68.4	36.7	71.5	32.8
38230 38	Auxiliary stations and analog computing devices associated with the above (including manual loaders, auto-to-manual stations, ratio stations, adders, multipliers, integrators, etc.) ----- do-----	21.8	11.5	34.2	15.0
38230 07	Electronic systems, nonunified architecture type ----- (X)-----	778.2		(X)	519.1
38230 12	Industrial multifunction process computers ----- (X)-----	177.9		(X)	175.3
	Pneumatic systems, including all system-type control, display and computing instruments actuated from standardized pneumatic transmission signals:				
38230 39	Controllers (recording, indicating, or blind) ----- thousands-----	60.2	38.0	52.2	39.1
38230 40	Recorders, with or without self-contained set-point stations ----- do-----	3.4	5.9	9.1	10.8
38230 41	Indicators, with or without self-contained set-point stations ----- do-----	1.3	.7	4.5	2.0
38230 42	Auxiliary stations and analog computing devices associated with the above (including manual loaders, auto-to-manual stations, ratio stations, adders, multipliers, integrators, etc.) ----- do-----	55.2	18.0	27.4	9.3
38230 43	Receiver-type gauges, analog and digital ----- do-----	692.8	14.9	542.7	10.8
38230 44	Annunciators, industrial; electromechanical and solid-state types ----- do-----	10.2	22.3	12.2	33.3
	Temperature instruments (excluding receiver-type instruments):				
	Electrical and electronic measuring types (thermocouple, resistance temperature detector, radiation, and other electrical sensors):				
38230 45	Direct-deflecting types (controllers for all types of electrical temperature sensors) ----- thousands-----	17.7	9.6		
38230 46	Direct-deflecting types (indicators and recorders for all types of electrical temperature sensors) ----- do-----	113.9	7.7	602.9	30.5
38230 47	Electromechanical self-balancing types (electric or pneumatic controllers for all types of electrical temperature sensors) ----- do-----				
38230 48	Electromechanical self-balancing types (indicators, recorders, and integrators for all types of electrical temperature sensors) ----- do-----	117.7	37.8	29.0	14.2
38230 49	Electronic controllers for all types of electrical temperature sensors ----- do-----			15.4	32.3
38230 50	Digital indicators for all types of electrical temperature sensors (excluding data loggers) ----- do-----	380.5	84.4	204.6	39.9
	Transmitters, producing standardized electric or pneumatic analog transmission signals for all types of electrical temperature sensors:				
38230 54	Electric ----- thousands-----	72.6	19.4	48.8	16.2
38230 55	Pneumatic ----- do-----	2.7	1.6	1.8	1.2

See footnotes at end of table.

Table 6a-2. Related Products From Current Industrial Reports Series—Value of Shipments by All Producers: 1987 and 1982—Con.

[Additional detail is provided in the Current Industrial Report series. For meaning of abbreviations and symbols, see introductory text]

1987 product code	Product	1987 product shipments		1982 product shipments	
		Quantity	Value (million dollars)	Quantity	Value (million dollars)
	MA38B, SELECTED INSTRUMENTS AND RELATED PRODUCTS—Con.				
38230 —	Process control instruments—Con. Temperature instruments (excluding receiver-type instruments)—Con. Mechanical measuring types, filled systems (liquid filled, vapor pressure, gas filled, and mercury filled types):				
38230 52	Indicating or recording controllers	191.9	21.1	228.5	34.8
38230 53	Recorders, noncontrol	55.3	6.2	35.6	8.4
38230 56	Indicators only (excluding indoor-outdoor and other household or appliance type thermometers)	1 223.4	28.9	1 163.7	23.0
38230 57	Transmitters producing standardized electric or pneumatic analog transmission signals	25.3	11.3	7.8	6.2
38230 59	Primary temperature sensors (excluding aircraft types): Thermocouples and thermocouple lead wire	(X)	167.7	(X)	135.0
38230 60	All other types (resistance temperature detectors, radiation and optical sensors, thermistors, etc.)	(X)	58.2	(X)	68.3
38230 61	Pressure (gauge, absolute vacuum) and draft instruments connected to the process (excluding receiver-type instruments and receiver-type gauge):				
38230 61	Indicating or recording controllers	240.2	36.2	134.0	49.4
38230 62	Recorders, noncontrol	4.3	2.6	11.0	4.9
38230 20	Indicators only (excluding receiver-type gauges): 3-inch diameter or more	3 281.6	95.2	4 018.3	101.2
38230 21	Less than 3-inch diameter	20 781.3	56.4	19 803.7	48.5
38230 24	Transmitters producing standardized analog transmission signals:				
38230 25	Transmitters producing standardized electronic analog transmission signals	2 198.1	140.4	180.3	76.1
38230 25	Transmitters producing standardized pneumatic analog transmission signals	9.2	6.0	14.3	10.8
38230 65	Flow and liquid level instruments connected to the process: Differential pressure types:				
38230 65	Indicating or recording controllers	53.9	11.2	49.0	17.0
38230 66	Recorders, noncontrol and indicators, noncontrol	79.4	40.2	110.4	46.3
38230 27	Transmitters producing standardized analog transmission signals:				
38230 28	Transmitters producing standardized electronic analog transmission signals	260.5	115.5	91.0	92.9
38230 28	Transmitters producing standardized pneumatic analog transmission signals	25.7	16.2	25.8	26.9
38230 29	Primary pressure sensors (load cells, strain gauges, etc.)	93.7	46.2	23.1	18.2
38230 68	Primary flow elements (including orifice plates, venturi tubes, flow tubes, flow nozzles, pitot tubes, etc.)	246.0	37.1	326.4	51.7
38230 03	Electromagnetic flowmeters:				
38230 01	Primary device (magnetic flow tube)	116.4	45.6	58.5	33.3
38230 01	Secondary device (magnetic transmitter, recorder, indicator or controller which receives signal directly from primary device)	34.5	23.9	88.5	46.5
38230 04	Capacitance, ultrasonic, and other electronic types (including magnetic resonance, vortex-precession, and vortex-shedding type elements)	102.4	70.9	18.6	19.7
38230 71	Variable area-controlling, recording, indicating, and transmitting instruments and associated primary flow elements	799.6	67.9	691.6	64.0
38230 72	Float and displacement (controlling, recording, indicating, and transmitting instruments and associated primary flow elements.)	1 268.7	49.4	1 248.5	68.4
38230 73	Turbine, mass-flow and other types (controlling, recording, indicating, and transmitting instruments and associated primary flow elements)	120.1	104.4	72.0	62.8
38230 74	Humidity instruments (controlling, recording, indicating, and transmitting, and associated primary humidity elements; excluding home and general-purpose type)	43.0	24.4	75.7	16.6
38230 75	Continuous process instruments for on-stream gas and liquid analysis (including indicators, recorders, controllers, and analysis electrodes and cells; excluding laboratory analysis types):				
38230 75	Chromatographic analyzers	1.7	29.3	10.0	42.2
38230 76	Infrared analyzers	8.6	26.1	3.0	20.5
38230 77	Oxygen analyzers	15.1	31.3	11.4	34.4
38230 78	Other gas analyzers	51.0	76.2	27.5	59.7
38230 79	PH analyzers	56.9	23.1	15.9	18.7
38230 80	Other liquid analyzers	78.1	52.3	18.6	43.4
38230 06	Instruments for all process variables not listed above (speed, weight, position, sequence, density, specific gravity, mechanical load, electrical load, millivolts): Electrical and electronic types:				
38230 06	Direct-deflecting type controllers, indicators and recorders	9.5	5.7	10.0	24.8
38230 08	Electromechanical self-balance electric or pneumatic controllers, indicators, recorders, integrators	43.7	11.1	10.6	16.5
38230 85	Digital indicators	7.0	12.5	1.7	5.8
38230 86	Transmitters producing standardized electric or pneumatic analog transmission signals	2.8	3.4	18.2	6.8
38230 87	Mechanical measuring types:				
38230 87	Indicating or recording controllers	23.5	7.3	6.5	8.6
38230 88	Recorders, noncontrol	66.5	7.7	58.3	11.0
38230 89	Indicators only	210.1	45.0	22.5	22.1
38230 90	Transmitter, producing standardized electric or pneumatic analog transmission signals				
38230 91	All other industrial process instruments:				
38230 91	Other temperature instruments	(X)	175.0		
38230 92	Other flow and liquid level instruments	(X)	51.9	(X)	591.8
38230 93	Other continuous process instruments	(X)	124.5		
38230 94	Other industrial type instruments	(X)	375.8		

See footnotes at end of table.

Table 6a-2. Related Products From Current Industrial Reports Series—Value of Shipments by All Producers: 1987 and 1982—Con.

[Additional detail is provided in the Current Industrial Report series. For meaning of abbreviations and symbols, see introductory text]

1987 product code	Product	1987 product shipments		1982 product shipments	
		Quantity	Value (million dollars)	Quantity	Value (million dollars)
	MA38B, SELECTED INSTRUMENTS AND RELATED PRODUCTS—Con.				
38230 --	Process control instruments—Con. Parts, supplies, accessories, other primary sensors, n.e.c., panelboards, and other equipment associated with process control instrumentation:				
38230 95	Primarily designed for temperature instruments	(X)	14.0	(X)	497.0
38230 96	Primarily designed for flow and liquid level instruments	(X)	30.8		
38230 97	Primarily designed for continuous process instruments	(X)	110.7		
38230 99	Primarily designed for industrial type instruments	(X)	66.5		
38242 --	Integrating and totalizing meters for gas and liquids	(X)	589.3	(X)	(NA)
	Gas meters, consumption registering:				
	Diaphragm type:				
	Positive displacements; aluminum, iron, and tin case:				
38242 22	Residential size (less than 400 cu ft/hr of 0.64 specific gravity gas, at 0.5 inch water drop)	2 137.7	92.6	1 349.1	58.5
38242 24	Other sizes, including commercial and industrial	85.9	28.4	78.3	28.8
38242 26	Rotary type (all sizes)	do	do	19.4	20.7
38242 28	Turbine type (all sizes)	27.3	40.6	6.6	11.4
38242 29	Other gas meters, consumption registering	do	do	(NA)	(NA)
	Liquid meters, positive displacement with registers and counters:				
	Water meters, consumption registering:				
38242 33	Small meters, less than and including 1 inch	3 732.9	119.8	2 561.7	81.6
38242 35	Intermediate meters, more than 1 inch up to and including 2 inch	128.6	28.5	74.2	21.1
38242 37	Large meters, more than 2 inch	50.0	49.3	34.0	25.4
38242 41	Liquid fuel dispensing meters (excluding service station dispensing pumps)	195.8	44.6	317.6	68.8
38242 98	Other liquid meters; industrial bulk plants, pipeline, batching, treatment facilities	206.9	74.0	204.0	101.0
38242 99	Parts and components for gas and liquid meters (sold separately)	(X)	111.6	(X)	76.1
38243 --	Counting devices (excluding motor vehicle instruments)	(X)	197.8	(X)	(NA)
38243 19	Tachometers, including speed indicators	2 174.7	20.8	(NA)	(NA)
	Other:				
38243 21	Mechanical input	2 186.6	37.7	3 432.7	33.0
38243 23	Electrical input	2 186.6	37.7	2 179.0	26.6
38243 25	Electronic input	923.4	43.6	208.4	35.5
38243 27	Pneumatic input	do	do	(³)	(³)
38243 29	Other counters, including event recorders	do	do	336.3	319.7
38243 76	Taximeters	6.6	2.9	5.7	1.7
38243 82	Parking meters, including parts and components sold separately	(NA)	89.7	(NA)	(⁴)
38243 85	All other counting devices not specified above, including toll meters, fare collection equipment (systems), parking lot systems, etc., but excluding parking meters	(X)	3.2	(X)	450.3
38243 88	Components and parts for counting devices, except parking meters (sold separately)	(X)	232.1	(NA)	(NA)
38244 --	Motor vehicle instruments	(X)	232.1	(NA)	(NA)
38244 11	Speedometers (speedometers that include odometers are classified as speedometers)	10 241.4	144.9	(X)	(NA)
38244 21	Tachometers	80.1	2.4	(X)	(NA)
38244 31	Odometers (speedometers that include odometers are classified as speedometers)	455.4	4.4		
38244 41	Fuel level gauges	609.9	6.5		
38244 45	Water temperature gauges	629.7	3.8	(X)	(NA)
38244 51	Ammeters	498.0	4.4		
38244 55	Oil pressure gauges	(X)	65.7		
38244 99	Other motor vehicle instruments	(X)	65.7		
38251 --	Electrical integrating instruments	(X)	400.5	(X)	339.0
	Ac watt-hour meters:				
	Single phase:				
38251 10	Detachable types	4 162.0	125.5	(⁵)	(⁵)
38251 11	A-base types	do	do		
38251 14	Switchboard types	328.1	57.5	53 117.1	597.8
38251 15	Polyphase	do	do	416.2	45.1
38251 35	Demand meters (kW and kVA), combined watt-hour and demand meters (single phase and polyphase), and combined watt-hour and time switch meters	368.9	101.4	316.9	69.6
38251 51	Other electrical integrating meters (including dc watt-hour meters, ampere-hour meters, and other miscellaneous integrating instruments not included in above classifications)	(X)	30.6	(X)	45.3
38251 61	Parts and accessories for electric integrating meters (including meter mountings, registers, and test equipment) sold separately	(X)	85.4	(X)	81.2
38252 --	Test equipment for testing electrical, radio and communication circuits, and motors	(X)	6 143.6	(X)	(NA)
	Voltage, current, and resistance measuring equipment (except multimeters):				
	Electronic:				
38252 20	Digital	(X)	240.8	(X)	130.6
38252 21	Analog	(X)	33.1	(X)	50.6
38252 22	Electrical (excluding panel meters)	(X)	28.4	(X)	27.3
	Multimeters:				
	Electronic:				
38252 28	Digital	(X)	118.8	(X)	80.8
38252 29	Analog	(X)	17.6	(X)	6.7
38252 30	Electrical	(X)	17.6	(X)	17.6
	Power and energy measuring equipment:				
	Electronic:				
38252 25	Analog	(X)	41.3	(X)	7.9
38252 26	Digital	(X)	55.3	(X)	6.3
38252 27	Electrical power measuring equipment (excluding electrical integrating instruments, sold separately)	(X)	1.8	(X)	5.1

See footnotes at end of table.

Table 6a-2. Related Products From Current Industrial Reports Series—Value of Shipments by All Producers: 1987 and 1982—Con.

[Additional detail is provided in the Current Industrial Report series. For meaning of abbreviations and symbols, see introductory text]

1987 product code	Product	1987 product shipments		1982 product shipments	
		Quantity	Value (million dollars)	Quantity	Value (million dollars)
	MA38B, SELECTED INSTRUMENTS AND RELATED PRODUCTS—Con.				
38252 —	Test equipment for testing electrical, radio and communication circuits, and motors—Con.				
	Frequency counters, timers, and other frequency and time measuring equipment (excluding standards):				
38252 31	Universal counters with time interval measuring capability				
38252 36	Stroboscopes	(X)	78.6	(6)	(6)
38252 32	Microwave counters (capable of operating more than 1300 MHz)				
38252 33	Other frequency counters	(X)	5.7	(6)	(6)
38252 34	Frequency meters				
38252 39	Other frequency counting and time measuring equipment	(X)	27.9	636.0	698.4
	Waveform measuring and/or analyzing equipment:				
	Oscilloscopes and plug-in accessories:				
38252 12	Less than 10 MHz				
38252 10	10 MHz up to 99.9 MHz	(X)	426.7	(X)	427.0
38252 11	100 MHz or more				
38252 14	Oscillographs	(X)	2.7		
	Spectrum analyzers:				
38252 15	Capable of operating above 100 kHz	(X)	54.6	(X)	248.5
38252 17	Other spectrum analyzers	(X)	9.4		
38252 16	Other waveform measuring and analyzing equipment	(X)	164.9		
	Signal generating equipment:				
38252 56	Audio	(X)	26.3	(X)	66.0
38252 58	RF (more than 20 kilocycles to 890 megacycles)	(X)	174.5	(X)	142.3
38252 59	Microwave (890 megacycles or more)	(X)	156.0	(X)	70.3
	Field strength and intensity measuring equipment (including RFI measuring equipment):				
38252 91	Electronic	(X)	(D)	(X)	118.8
38252 92	Electrical field measuring equipment	(X)	(D)	(X)	10.1
	Impedance and standing wave ratio measuring equipment (transfer function measuring equipment):				
38252 93	Electronic impedance and related measuring equipment	(X)	21.1	(X)	16.0
38252 94	Standing wave measuring equipment (slotted lines, sliding short, reflectometers, and other SWR equipment)	(X)	27.1	(X)	33.7
38252 97	X-Y plotters (recorders), electronic	(X)	19.3	(X)	167.5
	Automatic test and measuring equipment:				
38252 44	Combination and/or group test sets			(X)	562.6
	Component part test sets:				
38252 45	Electron tube test equipment	(X)	622.2	(X)	(7)
	Semiconductor component test equipment:				
38252 61	Memory	(X)	122.1	(X)	(7)
38252 63	Linear	(X)	116.3	(X)	(7)
38252 65	Microprocessor	(X)	38.6	(X)	(7)
38252 67	Other semiconductor component test equipment	(X)	287.5	(X)	(7)
38252 69	Circuit board loaded test equipment	(X)	308.1	(X)	7256.4
38252 47	Other component part test sets and equipment	(X)	151.2	(X)	69.0
38252 48	Equipment and subassembly test equipment, n.e.c.	(X)	297.8	(X)	190.4
	Standards and calibration equipment for test measuring equipment, including laboratory types:				
38252 72	Electronic			(X)	94.6
38252 74	Electrical	(X)	185.9	(X)	39.2
	Analzers for testing characteristics of internal-combustion engines (excluding aircraft):				
38252 37	Portable				
38252 38	Other	(X)	273.6	(X)	220.9
	Communications test equipment, n.e.c.:				
38252 81	Network analyzers	(X)	90.0	(X)	(NA)
38252 83	Cable backplane and other continuity testers	(X)	38.2	(X)	(NA)
38252 85	Fiber optics test equipment (OTDR, optical S/N meters, etc.)	(X)	11.5	(X)	(NA)
38252 87	Other communications test, monitoring, and control equipment (except microwave)	(X)	223.7	(X)	(NA)
38252 52	Microwave test equipment, n.e.c., (1,300 MHz or more)	(X)	47.2	(X)	120.5
	Logic test, development, and analysis equipment:				
38252 01	Logic analyzers, and similar logic state, timing, and signature analyzers	(X)	116.0	(X)	(NA)
38252 03	Microprocessor development systems	(X)	84.0	(X)	(NA)
38252 05	Pulse, function, and data generators and similar metered frequency synthesizers	(X)	133.9	(X)	(NA)
	Other field service test and measurement equipment:				
38252 07	Logic probes, clips, comparators, pulsers, and current tracers				
38252 09	Other field service equipment specifically designed for other troubleshooting digital circuits	(X)	12.9	(X)	(NA)
38252 02	Other measuring and checking instruments for testing electrical, radio communications, circuits, and motors	(X)	645.0	(X)	(NA)
	Other analyzing instruments for checking electrical quantities:				
38252 04	With a recording device				
38252 06	Other	(X)	70.7	(X)	(NA)
38252 99	Parts and components for test equipment for testing electrical, radio and communication circuits, and motors (sold separately)	(X)	295.2	(X)	28.6

See footnotes at end of table.

Table 6a-2. Related Products From Current Industrial Reports Series—Value of Shipments by All Producers: 1987 and 1982—Con.

[Additional detail is provided in the Current Industrial Report series. For meaning of abbreviations and symbols, see introductory text]

1987 product code	Product	1987 product shipments		1982 product shipments	
		Quantity	Value (million dollars)	Quantity	Value (million dollars)
	MA38B, SELECTED INSTRUMENTS AND RELATED PRODUCTS—Con.				
38253 —	Instruments to measure electricity -----	(X)	646.5	(X)	539.0
	Electrical indicating instruments (including both digital types and those where a pointer is made to move over a calibrated scale, such movement being effected by the action of the electrical current and/or voltage):				
	Panel type instruments (includes all aircraft types and all miniaturized instruments plus or minus 3 percent) and rectifier instruments which can be enclosed in a case suitable for mounting on a panel and are an end product. Excludes all instruments for use on motor vehicles which are capable of accuracies of plus or minus 2 percent of full scale indication):				
38253 08	Digital panel meters (DPM) between 0.05 percent and 1 percent, plus or minus 1 digit accuracy (excluding precision DVM's and electronic counters) -----thousands..	467.4	37.1	284.3	25.5
38253 10	Analog solid state panel meters (generally of plus or minus 2 percent accuracy) with LED, LCD, or neon gas discharge display -----do..	83.9	5.5	89.2	6.9
	Panel type other than ruggedized or sealed (generally of 2 percent accuracy):				
38523 12	Ac (including moving iron vane and dynamometer types) -----thousands..	242.0	9.9	528.4	11.5
38253 13	Dc (including rectifier and self-contained thermocouple types) -----do..	1 809.5	33.6	2 808.7	45.4
38253 11	Panel types ruggedized or sealed (generally of 2 percent accuracy) -----do..	253.6	9.6	334.1	9.7
	Panel types with control or signal initiating means (including instrument relays):				
38253 16	Indicating -----thousands..	78.3	5.3	89.2	7.4
38253 17	Nonindicating -----do..	2.4	.7		
38253 19	All other panel type instruments, including ammeters and voltmeters for motor vehicles -----do..	9 898.7	44.0	9 480.2	39.9
	Switchboard instruments which are generally of 1 percent accuracy:				
38253 23	Ac (including moving iron vane and dynamometer types) -----thousands..	75.9	17.0	58.6	10.3
38253 25	Dc (including rectifier and thermocouple types) -----do..	40.3	6.0	56.8	7.9
38253 27	Elapsed time meters (with and without reset) -----do..	1 248.3	29.5	1 481.2	24.3
	Portable instruments which are generally capable of accuracies within plus or minus 2 percent full scale indication, and can be enclosed in a case so that they can be moved and used at various locations, and which are an end product:				
38253 29	Portable types (accuracy rating 0.11 percent through 0.50 percent) -----thousands..	2.2	1.8	2.6	1.4
38253 30	Portable type (accuracy rating 0.51 percent through 2 percent) -----do..	18.8	3.2	80.7	6.6
38253 35	Laboratory portable instruments with accuracies within plus or minus 1 percent up to 1/10 percent of full scale and better (all case sizes) -----do..	38.6	8.0	4.4	2.2
38253 37	Volt-ohm millimeter (VOM), accuracy 0.10 percent through 5 percent -----do..			(⁸)	(⁸)
38253 45	Other electrical indicating instruments (except self-balancing types) -----do..	115.7	7.8	⁸ 180.6	⁸ 9.8
	Electrical recording instruments (portable and for panel mounting):				
38253 50	Direct deflecting (direct acting), except temperature calibrated instruments -----thousands..	63.8	9.2	37.0	16.0
	Oscillographic recorders:				
38253 63	Pen or stylus type -----thousands..	104.1	71.5	93.4	64.0
38253 65	Light beam type -----do..			38.5	68.8
38253 72	Other electrical recording instruments -----do..	(X)	257.1	(X)	116.7
	Parts and accessories for indicating and recording instruments:				
38253 74	Transducers for volts, amperes, watts, vars, frequency, temperature, and power factor -----do..	(X)	49.9	(X)	35.3
38253 75	Tachometer generators, except aerospace types -----do..	(X)	19.9	(X)	13.4
38253 76	Other, including instrument shunts -----do..	(X)	19.7	(X)	16.0
38260 —	Analytical and scientific instruments (except optical) -----	(X)	3 046.1	(X)	(NA)
	Electrochemical instruments:				
38260 01	Ph electrodes and meters -----do..	(X)	35.6	(X)	39.2
38260 03	Ion selective electrodes and meters -----do..	(X)	22.0	(X)	15.2
38260 04	Electrophoresis instruments -----do..	(X)	57.4	(X)	26.9
38260 05	Other, except process type (include photometers) -----do..			(X)	38.6
	Chromatographic instruments:				
38260 07	Gas -----number..	66 734	173.3	21 271	130.1
38260 08	Liquid -----do..				
38260 09	Other, including paper, gel, thin layer -----do..	49 570	299.9	33 110	165.8
	Spectrophotometric instruments:				
38260 24	Atomic absorption -----number..	6 488	70.5	(X)	(⁹)
38260 25	Optical emission, including spark, arc, and glow, spectrographs, all other, except ICP -----do..	187	12.4	(¹⁰)	(¹⁰)
38260 27	Optical emission, including laser excited source (including laser microprobe source emission, laser source Raman, and laser microprobe source Raman spectrometers) -----do..	3 922	25.9	¹⁰ 13 063	¹⁰ 24.3
38260 28	Optical emission with inductively coupled plasma, ICP -----do..				
38260 30	Infrared (including Fourier transform methods) -----do..	9 555	194.8	3 126	53.9
38260 31	Ultraviolet, visible and colorimeters -----do..	26 904	90.4	23 307	118.3
38260 33	Fluorescent instruments, including fluorometers (except chemicals) -----do..	2 958	36.1	1 542	10.0
38260 35	Color measuring devices -----do..	18 288	72.9	(NA)	(NA)
38260 36	Other, including vacuum ultraviolet, Raman, light scattering reflectors, helium glow, and light measuring -----do..	(X)	16.8	(X)	⁹ 162.1
38260 37	Thermal analysis instruments, including thermogravimetric analyzers (TGA), quantitative thermal analyzers (QTA) and differential thermal analyzers (DTA) -----do..	(X)	91.4	(X)	33.7

See footnotes at end of table.

Table 6a-2. Related Products From Current Industrial Reports Series—Value of Shipments by All Producers: 1987 and 1982—Con.

[Additional detail is provided in the Current Industrial Report series. For meaning of abbreviations and symbols, see introductory text]

1987 product code	Product	1987 product shipments		1982 product shipments	
		Quantity	Value (million dollars)	Quantity	Value (million dollars)
	MA38B, SELECTED INSTRUMENTS AND RELATED PRODUCTS—Con.				
38260 —	Analytical and scientific instruments (except optical)—Con.				
38260 37	Thermal analysis instruments, including thermogravimetric analyzers (TGA), quantitative thermal analyzers (QTA) and differential thermal analyzers (DTA)—Con.				
38260 38	Nuclear magnetic resonance instruments, including electron paramagnetic spin types (EP)..... number..				
38260 39	Microscopes, electron and proton, including scanning..... do..			⁽¹¹⁾ 1415	⁽¹¹⁾ 147.4
38260 53	Particle beam excitation instruments including electron microprobes, auger, energy ion spectroscopes, secondary ion mass spectrometer (SIMS), ion microprobes..... do..	539	109.9	39	4.8
38260 55	Photon excitation analyzers, including x-ray fluorescence-simultaneous, x-ray fluorescence-sequential, x-ray fluorescence-sequential with diffraction, x-ray fluorescence-diffraction, x-ray diffraction, and energy dispersive systems (EDS)..... do..	907	43.8	260	10.2
38260 61	Mass spectroscopy instrumentation..... (X)	(X)	180.9	(X)	90.3
	Clinical laboratory instrumentation, including instruments used in the clinical laboratory for measuring, analyzing, and processing clinical specimens:				
38260 71	Chemistry (measure and identify substances, such as metabolites, enzymes, and drugs)..... number..	16 805	300.8	15 057	160.8
38260 72	Hematology (measure and identify substances or cells contained in blood or substances influencing the development and clotting of blood, such as cell counting coagulation factors)..... do..	15 938	211.5	8 068	142.3
38260 73	Microbiology (enumerate or identify pathogenic organisms or measure their susceptibility to antimicrobial agents)..... do..	4 048	16.4	(X)	⁽¹²⁾
38260 74	Histology (process tissue and cells, such as tissue processors, cell stainers)..... do..				
38260 75	Blood bank and immunology (process blood and specimens for testing; measure and identify, using immunoassay, substances in clinical specimens)..... do..	16 817	88.5	(X)	¹² 64.1
38260 76	Other clinical laboratory instrumentation not specified above..... do..	(NA)	100.7	18 873	274.0
38260 78	Elemental analysis instruments, including carbon, hydrogen, nitrogen, oxygen, and sulphur..... number..	56 105	64.0	184 879	92.6
38260 92	Amino acid, protein and/or peptide analyzers (including chromatographic type)..... do..				
38260 94	Other analytical and scientific instruments, n.e.c., including molecular weight, monochrometers (analytical type), nephelometers (except meteorological), osmometers, particle size analyzers, photo multipliers, surface area analyzers, turbidometers, and breatholyzers..... do..	(X)	349.7	(X)	135.0
38260 98	Parts, components, and accessories for analytical and scientific instruments (sold separately), including photo tubes, thermal conductivity sensors, thermopiles, etc., which are not specifically provided for in product class 38272, Binoculars and astronomical instruments, or 38273, Other optical instruments and lenses..... do..	(X)	380.4	(X)	150.7
38271 —	Sighting, tracking, and fire-control equipment, optical type..... do..	(X)	726.1	(X)	(NA)
38271 01	Made from lenses, prisms, etc., produced in the same plant..... do..	(X)	249.1	(X)	289.9
38271 02	Made from purchased lenses, prisms, etc. do..	(X)	451.1	(X)	202.3
38271 99	Parts and accessories..... do..	(X)	25.9	(X)	(NA)
38272 —	Binoculars and astronomical instruments..... do..	(X)	35.1	(X)	(NA)
38272 01	Binoculars, prismatic and nonprismatic, terrestrial and celestial telescopes..... do..	(X)	22.8	(X)	6.9
38272 03	Other astronomical instruments (excluding radio astronomy)..... do..				
38272 09	Parts and accessories (including mountings) for binoculars, optical telescopes, and other astronomical equipment..... do..	(X)	12.4	(X)	(NA)
38273 —	Other optical instruments and lenses..... do..	(X)	1 179.7	(X)	886.8
38273 12	Optical test and inspection equipment including standard sources, modulators, optical comparators, interferometers (except optical microscopes)..... do..	(X)	214.3	(X)	67.2
38273 15	Optical microscopes..... do..	(X)	58.0	(X)	59.4
38273 17	Optical components:				
	Filters and parts and accessories..... do..	(X)	63.4	(X)	⁽¹³⁾
38273 21	Lenses, except ophthalmic focus lenses:				
	Unmounted lenses..... do..	(X)	90.9	(X)	69.0
	Mounted lenses:				
38273 22	Photographic lenses..... do..	(X)	12.2	(X)	14.5
38273 23	Other mounted lenses..... do..	(X)	82.2	(X)	32.4
38273 29	Other (prisms, mirrors, etc.)..... do..	(X)	88.7	(X)	¹³ 167.7
38273 59	Other optical instruments (including optical alignment and display instruments) excluding analytical instruments and binoculars and astronomical instruments listed above and sighting and fire control equipment..... do..	(X)	12.4	(X)	476.6
38273 39	Parts and accessories for optical microscopes..... do..	(X)	91.1	(X)	(NA)
38273 49	Parts and accessories for other optical instruments..... do..	(X)	466.4	(X)	(NA)
38291 —	Aircraft engine instruments, except flight..... do..	(X)	520.0	(X)	290.3
38291 45	Temperature sensors, transmitters, and displays..... do..	(X)	107.5	(X)	53.9
38291 46	Pressure ratio sensors, displays, and controls..... do..	(X)	52.2	(X)	18.8
38291 47	Pressure and vacuum sensors, transmitters, and displays..... do..	(X)	28.1	(X)	11.2
38291 58	Fuel and oil flow rate sensors, transmitters, and displays, including mixture controls..... do..	(X)	53.0	(X)	50.3
38291 60	Fuel and oil quantity sensors, transmitters, and displays including densitometers..... do..	(X)	114.1	(X)	56.4
38291 62	Tachometer generators and indicators..... do..	(X)	14.2	(X)	9.2
38291 98	All other not specified above..... do..	(X)	148.4	(X)	90.5
38291 99	Parts and components for aircraft engine instruments, except flight (sold separately)..... do..	(X)	2.4	(X)	-

See footnotes at end of table.

Table 6a-2. Related Products From Current Industrial Reports Series—Value of Shipments by All Producers: 1987 and 1982—Con.

[Additional detail is provided in the Current Industrial Report series. For meaning of abbreviations and symbols, see introductory text]

1987 product code	Product	1987 product shipments		1982 product shipments	
		Quantity	Value (million dollars)	Quantity	Value (million dollars)
	MA38B, SELECTED INSTRUMENTS AND RELATED PRODUCTS—Con.				
38292 —	Physical properties testing and inspection equipment and kinematic testing and measuring equipment	(X)	859.4	(X)	590.7
38292 32	Physical properties testing equipment including hardness, tensile, stress, strain, abrasion, strength, torsion, wear, and similar testing equipment (including components and parts sold separately):	(X)	177.8		
38292 34	For testing of metals	(X)	205.5		
38292 39	Other	(X)	23.8	(X)	271.0
	Parts for physical properties testing equipment (sold separately)	(X)			
38292 52	Physical properties inspection equipment, including flow detection thickness, measuring, and similar inspection equipment (including components and parts sold separately):	(X)	111.4		
38292 54	For testing of metals	(X)	39.2		
38292 56	Measuring and checking flow of fluids	(X)	133.0	(X)	179.1
38292 58	Other	(X)	19.9		
	Parts for physical properties inspection equipment (sold separately)	(X)			
38292 94	Kinematic testing and measuring equipment, (including vibration, acceleration, and other motion testing equipment):	(X)	9.2		
38292 95	For testing of metals	(X)	132.7		
38292 98	Other	(X)	7.0	(X)	140.6
	Parts for kinematic testing and measuring equipment (sold separately)	(X)			
38294 —	Nuclear radiation detection and monitoring instruments	(X)	637.2	(X)	561.6
38294 02	Radiation detecting elements (including ion chambers) thousands	195.5	65.3		
38294 04	Solid-state detectors do	8.0	19.5	40.1	46.6
38294 06	Nuclear monitoring instruments (including environmental, personal dosimetry, and medical monitors, both stationary and portable types)	(X)	126.4	(X)	103.9
38294 07	Medical and biological counting systems for in vivo counting				
38294 09	Sample and flow counting systems, manual and automatic	(X)	30.7	(X)	28.7
38294 19	Scalers thousands	1.3	4.9	11.8	12.1
38294 21	Special amplifiers for nuclear applications do	6.4	4.0	4.1	5.6
	Pulse analyzers (including nuclear spectrometers):				
38294 22	Single channel pulse height analyzers thousands			1.0	3.7
38294 23	Multichannel pulse height analyzers do	2.5	27.3	2.6	29.2
38294 25	Count rate meters do	4.5	3.9	1.0	.9
38294 29	Measurement and control devices using beta, gamma, or neutron gauge technology	(X)	160.4	(X)	129.9
38294 28	Input-output accessories for multichannel analyzers	(X)	9.9	(X)	1.5
38294 30	Nuclear power supplies	(X)		(X)	9.4
38294 32	Neutron and photon activation analysis systems	(X)	29.1	(X)	27.7
38294 34	Nuclear instrument modules, n.e.c.				
38294 39	Other nuclear radiation detection and monitoring instruments	(X)	119.3	(X)	146.8
38294 98	Parts and components for nuclear radiation detection and monitoring instruments (sold separately)	(X)	36.3	(X)	15.6
38295 —	Commercial, geophysical, meteorological and general purpose instruments	(X)	358.0	(X)	(NA)
38295 20	Barometers and barographs, aneroid and mercurial types, including recorders, wall, pendant, meteorological, hygrothermographs, barometer-thermometer-humidity combinations	(X)	9.1	(X)	9.9
38295 21	Hydrometers, glass, all types, including thermohydrometers thousands	303.8	2.6	356.6	2.4
38295 22	Liquid-in-glass thermometers:				
	Engraved (etched) stem, thermoregulators, deep-sea reversing, laboratory, encased glass, ASTM standards, pocket case, max-min registering, except clinical thermometers	(X)	8.0	(X)	9.5
38295 23	Threaded and flanged types, fixed adjustable angle, conditioning, and refrigeration installations thousands	507.3	7.5	730.4	6.5
38295 24	Household and commercial thermometers such as wall, outdoor, domestic science, cupcase, filled systems, indoor-outdoor do	7 073.4	15.1	10 144.8	12.4
38295 34	Clinical (fever) thermometers (including digital) do	30 568.8	14.8	45 132.5	17.8
38295 25	Bimetal thermometers:				
	Threaded and flanged types, for pipeline and duct installations, including general and pocket test thousands	1 910.2	23.7	3 235.0	25.4
38295 26	Domestic science, commercial general test, indoor, outdoor, desk models, oven, refrigerator do	7 111.2	14.6	7 475.8	15.1
38295 28	Humidity indicating and recording instruments such as bihygroscopic and hygroscopic element, indicators, psychrometers, wet and dry bulb, hygrographs, indicating hygrometers	(X)	6.5	(X)	(¹⁴)
38295 29	Other thermometers (infrared, meteorological, commercial and industrial)	(X)	14.7	(X)	(NA)
38295 31	Other meteorological instruments, including speed and direction instruments, rain gauges, thermographs, and parts (sold separately)	(X)	31.2	(X)	64.0
38295 32	Geophysical instruments, including hydrographic and hydrological	(X)	49.3	(X)	(NA)
38295 33	Other commercial and industrial instruments (except aircraft) including compasses, altimeters, test equipment for hydraulic and pneumatic systems and controls (sold separately)	(X)	158.2	(X)	¹⁴ 162.3
38295 39	Parts and accessories for meteorological and commercial and industrial instruments	(X)	2.7	(X)	(NA)

See footnotes at end of table.

Table 6a-2. Related Products From Current Industrial Reports Series—Value of Shipments by All Producers: 1987 and 1982—Con.

[Additional detail is provided in the Current Industrial Report series. For meaning of abbreviations and symbols, see introductory text]

1987 product code	Product	1987 product shipments		1982 product shipments	
		Quantity	Value (million dollars)	Quantity	Value (million dollars)
	MA38B, SELECTED INSTRUMENTS AND RELATED PRODUCTS—Con.				
38296 —	Surveying and drafting instruments and associated equipment -----	(X)	246.5	(X)	(NA)
38296 11	Surveying instruments, including alidades, transits, plumb bobs, sextants, theodolites, surveyors, compasses, surveyors levels, tapes, etc. -----	(X)	109.7	(X)	42.5
38296 19	Parts and components for surveying instruments (sold separately) -----	(X)	2.9	(X)	(NA)
38296 21	Drafting instruments and machines, manual and automatic, plotting instruments, slide rules, T-squares, drafting templates, rules, etc. -----	(X)	116.1	(X)	(¹⁵)
38296 29	Parts and components for drafting instruments and machines (sold separately) -----				
38296 31	Photogrammetric and geodetic equipment, excluding cameras -----	(X)	17.7	(X)	¹⁵ 78.5
38296 39	Parts and components for photogrammetric and geodetic equipment (sold separately) -----				

¹For 1982, product codes 38122 73 and 38122 75 were combined to avoid disclosing data for individual companies.

²For 1987 and 1982, product codes 38295 51 and 38122 78 were combined to avoid disclosing data for individual companies.

³For 1982, product codes 38243 27 and 38243 29 were combined to avoid disclosing data for individual companies.

⁴For 1982, product codes 38243 82, 38243 85, and 38243 88 were combined to avoid disclosing data for individual companies.

⁵For 1982, product codes 38251 10, 38251 11, and 38251 14 were combined to avoid disclosing data for individual companies.

⁶For 1982, product codes 38252 31, 38252 36, 38252 32, 38252 33, 38252 34, and 38252 39 were combined to avoid disclosing data for individual companies.

⁷For 1982, product codes 38252 45, 38252 61, 38252 63, 38252 65, and 38252 69 were combined to avoid disclosing data for individual companies.

⁸For 1982, product codes 38253 37 and 38253 45 were combined to avoid disclosing data for individual companies.

⁹For 1982, product codes 38260 24 and 38260 36 were combined to avoid disclosing data for individual companies.

¹⁰For 1982, product codes 38260 25, 38260 27, and 38260 28 were combined to avoid disclosing data for individual companies.

¹¹For 1982, product codes 38260 38 and 38260 39 were combined to avoid disclosing data for individual companies.

¹²For 1982, product codes 38260 73, 38260 74, and 38260 75 were combined to avoid disclosing data for individual companies.

¹³For 1982, product codes 38273 17 and 38273 29 were combined to avoid disclosing data for individual companies.

¹⁴For 1982, product codes 38295 28 and 38295 33 were combined to avoid disclosing data for individual companies.

¹⁵For 1982, product codes 38296 21, 38296 29, 38296 31, and 38296 39 were combined to avoid disclosing data for individual companies.

Table 6b. Product Classes—Value of Shipments by All Producers for Specified States: 1987 and 1982

[Million dollars. Product classes covered are those that are economically significant and whose production is geographically dispersed, provided dispersion is not approximated by data in table 2. Also, product classes are not shown if they are miscellaneous or "not specified by type" classes. Statistics for some States are withheld because they are either less than \$2 million in product class shipments or they disclose data for individual companies in 1987. For meaning of abbreviations and symbols, see introductory text. For comparability of product classes and product codes between 1982 and 1987 and explanation of terms, see appendixes]

Product class and geographic area	1987 value of product shipments	1982 value of product shipments	Product class and geographic area	1987 value of product shipments	1982 value of product shipments
38121, AERONAUTICAL, NAUTICAL, AND NAVIGATIONAL INSTRUMENTS, NOT SENDING OR RECEIVING RADIO SIGNALS			38242, INTEGRATING AND TOTALIZING METERS FOR GAS AND LIQUIDS		
United States -----	2 267.6	1 418.7	United States -----	609.0	519.6
California -----	261.5	208.5	California -----	14.9	12.4
Connecticut -----	109.6	55.0	Pennsylvania -----	219.4	182.9
Illinois -----	13.5	6.9	Texas -----	32.9	36.9
Kansas -----	17.2	18.7			
Massachusetts -----	192.0	109.9	38243, COUNTING DEVICES		
			United States -----	219.3	162.0
Michigan -----	126.5	92.1	Connecticut -----	34.0	(NA)
New Jersey -----	159.6	144.2	Illinois -----	59.4	30.8
New York -----	64.6	38.9	New York -----	6.4	(NA)
Pennsylvania -----	205.1	98.6	Texas -----	6.1	(NA)
			38244, MOTOR VEHICLE INSTRUMENTS		
38122, SEARCH, DETECTION, NAVIGATION, AND GUIDANCE SYSTEMS AND EQUIPMENT			United States -----	241.2	76.2
United States -----	30 886.3	(NA)	Illinois -----	21.4	(NA)
Alabama -----	130.0	(NA)	Pennsylvania -----	13.8	(NA)
Arizona -----	575.2	(NA)			
California -----	9 106.0	(NA)	38251, INTEGRATING INSTRUMENTS, ELECTRICAL		
Colorado -----	782.5	(NA)	United States -----	399.8	363.2
Connecticut -----	367.4	(NA)	Ohio -----	12.3	9.0
Florida -----	1 585.5	(NA)			
Illinois -----	554.4	(NA)	38252, TEST EQUIPMENT FOR TESTING ELECTRICAL, RADIO AND COMMUNICATION CIRCUITS, AND MOTORS		
Maryland -----	2 119.0	(NA)	United States -----	6 116.8	4 455.2
Massachusetts -----	1 929.1	(NA)	Alabama -----	56.2	(NA)
Missouri -----	181.6	(NA)	Arizona -----	28.9	29.2
New Jersey -----	2 115.7	(NA)	California -----	1 626.0	1 401.5
New York -----	3 768.0	(NA)	Connecticut -----	69.1	54.1
North Carolina -----	135.5	(NA)	Florida -----	63.8	23.0
Ohio -----	108.7	(NA)			
Pennsylvania -----	279.4	(NA)			
Texas -----	2 396.9	(NA)			
Virginia -----	1 274.5	(NA)			
Wisconsin -----	122.1	(NA)			

Table 6b. Product Classes—Value of Shipments by All Producers for Specified States: 1987 and 1982—Con.

[Million dollars. Product classes covered are those that are economically significant and whose production is geographically dispersed, provided dispersion is not approximated by data in table 2. Also, product classes are not shown if they are miscellaneous or "not specified by type" classes. Statistics for some States are withheld because they are either less than \$2 million in product class shipments or they disclose data for individual companies in 1987. For meaning of abbreviations and symbols, see introductory text. For comparability of product classes and product codes between 1982 and 1987 and explanation of terms, see appendixes]

Product class and geographic area	1987 value of product shipments	1982 value of product shipments	Product class and geographic area	1987 value of product shipments	1982 value of product shipments
38252, TEST EQUIPMENT FOR TESTING ELECTRICAL, RADIO AND COMMUNICATION CIRCUITS, AND MOTORS—Con.			38291, AIRCRAFT ENGINE INSTRUMENTS, EXCEPT FLIGHT		
Illinois.....	184.4	152.6	United States	510.1	311.0
Indiana.....	36.4	(NA)	California.....	114.2	54.5
Maryland.....	61.8	39.6	Connecticut.....	32.0	(NA)
Massachusetts.....	571.3	419.8	Pennsylvania.....	4.5	(NA)
Michigan.....	53.5	104.0	Texas.....	9.4	8.9
Missouri.....	122.0	47.3	38292, PHYSICAL PROPERTIES AND KINEMATIC TESTING AND INSPECTION EQUIPMENT		
New Hampshire.....	68.4	40.8	United States	906.4	635.2
New Jersey.....	370.6	281.8	California.....	147.6	66.1
New York.....	478.0	261.3	Connecticut.....	26.7	45.3
North Carolina.....	20.7	6.7	Massachusetts.....	82.9	56.0
Ohio.....	113.9	53.8	Michigan.....	74.2	56.2
Pennsylvania.....	80.6	42.0	New Jersey.....	44.7	25.4
Texas.....	89.2	61.4	New York.....	67.0	47.1
Virginia.....	38.2	4.8	Ohio.....	42.7	24.1
Washington.....	702.3	271.5	Pennsylvania.....	75.4	52.8
Wisconsin.....	39.1	(NA)	Texas.....	17.0	64.0
38253, INSTRUMENTS TO MEASURE ELECTRICITY, N.E.C.			Washington.....	28.3	18.5
United States	671.0	556.7	Wisconsin.....	7.9	4.1
California.....	165.8	97.1	38294, NUCLEAR RADIATION DETECTION AND MONITORING INSTRUMENTS		
Connecticut.....	13.6	17.6	United States	645.0	596.4
Florida.....	10.2	13.0	California.....	68.0	(NA)
Illinois.....	25.5	36.3	Illinois.....	123.8	105.1
Massachusetts.....	52.5	74.3	Massachusetts.....	2.9	(NA)
New Hampshire.....	60.8	24.8	New York.....	64.6	37.1
New Jersey.....	13.1	24.0	Ohio.....	172.3	96.7
New York.....	21.6	17.5	Pennsylvania.....	11.7	11.4
Ohio.....	66.6	73.9	38295, COMMERCIAL, GEOPHYSICAL, METEOROLOGICAL, AND GENERAL PURPOSE INSTRUMENTS AND EQUIPMENT		
Pennsylvania.....	42.1	18.6	United States	891.5	(NA)
38271, SIGHTING, TRACKING, AND FIRE CONTROL EQUIPMENT, OPTICAL TYPE			Arizona.....	13.2	(NA)
United States	729.4	505.4	California.....	218.5	(NA)
Florida.....	28.3	(NA)	Colorado.....	5.6	(NA)
Massachusetts.....	79.6	46.5	Connecticut.....	38.7	(NA)
New York.....	28.2	25.9	Florida.....	58.3	(NA)
38272, BINOCULARS AND ASTRONOMICAL INSTRUMENTS			Illinois.....	5.4	(NA)
United States	36.3	(NA)	Maryland.....	26.0	(NA)
California.....	14.6	(NA)	Massachusetts.....	35.9	(NA)
38273, OPTICAL INSTRUMENTS AND LENSES, N.E.C.			Michigan.....	7.9	(NA)
United States	1 169.6	(NA)	Minnesota.....	4.4	(NA)
California.....	398.7	(NA)	New Jersey.....	80.2	(NA)
Connecticut.....	225.7	(NA)	New York.....	65.8	(NA)
Florida.....	15.9	(NA)	Ohio.....	16.3	(NA)
Illinois.....	12.6	(NA)	Pennsylvania.....	65.2	(NA)
Massachusetts.....	173.7	(NA)	Texas.....	125.1	(NA)
Michigan.....	19.6	(NA)	Wisconsin.....	5.1	(NA)
New Hampshire.....	6.2	(NA)	38296, SURVEYING AND DRAFTING INSTRUMENTS AND ASSOCIATED EQUIPMENT		
New Jersey.....	14.4	(NA)	United States	230.2	(NA)
New York.....	119.6	(NA)	California.....	36.3	(NA)
Pennsylvania.....	50.5	(NA)	Connecticut.....	12.7	(NA)
			Wisconsin.....	34.2	(NA)

Table 6c. Historical Statistics for Product Classes—Value Shipped by All Producers: 1987 and Earlier Years

[Million dollars. For meaning of abbreviations and symbols, see introductory text. For comparability of product classes and product codes between 1982 and 1987 and explanation of terms, see appendixes]

1987 product code	Product class	1987	1986 ¹	1985 ¹	1984 ¹	1983 ¹	1982	1977	1972
3812-	Search, detection, navigation, guidance, aeronautical and nautical systems, instruments, and equipment	34 016.9	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)
38121	Aeronautical, nautical, and navigational instruments, not sending or receiving radio signals	2 267.6	2 210.1	1 838.3	1 546.0	1 639.6	1 418.7	804.6	573.7
38122	Search, detection, navigation, and guidance systems and equipment	30 886.3	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)
38120	Search, detection, navigation, guidance, aeronautical, and nautical systems, instruments, and equipment, n.s.k.	863.0	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)
3821-	Laboratory apparatus and furniture	1 618.8	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)
38210	Laboratory apparatus and furniture	1 618.8	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)
3822-	Environmental controls	2 024.6	2 095.7	2 046.1	2 029.6	1 754.3	1 544.5	1 106.4	658.1
38220	Automatic controls for regulating residential and commercial environments and appliances	2 024.6	2 095.7	2 046.1	2 029.6	1 754.3	1 544.5	1 106.4	658.1
3823-	Process control instruments	4 371.5	4 321.5	4 453.6	4 114.8	3 718.4	3 915.1	2 061.1	794.7
38230	Process control instruments	4 371.5	4 321.5	4 453.6	4 114.8	3 718.4	3 915.1	2 061.1	794.7
3824-	Fluid meters and counting devices	1 133.1	992.8	958.0	860.2	829.3	787.1	634.3	327.4
38242	Integrating and totalizing meters for gas and liquids	609.0	544.1	555.3	459.2	470.4	519.6	344.0	207.7
38243	Counting devices	219.3	170.9	182.1	201.5	183.5	162.0	147.0	48.8
38244	Motor vehicle instruments	241.2	245.0	191.0	165.1	146.9	76.2	123.2	70.1
38240	Fluid meters and counting devices, n.s.k.	63.6	32.8	29.7	34.4	28.4	29.3	20.1	.8
3825-	Instruments to measure electricity	7 612.3	6 560.0	7 260.8	7 364.0	6 143.9	5 575.6	2 566.2	1 329.7
38251	Integrating instruments, electrical	399.8	416.8	426.6	448.2	368.8	363.2	223.5	169.5
38252	Test equipment for testing electrical, radio and communication circuits, and motors	6 116.8	5 279.5	5 962.3	5 928.7	5 061.0	4 455.2	1 784.9	869.0
38253	Instruments to measure electricity, n.e.c.	671.0	617.0	608.4	705.3	517.3	556.7	429.9	223.4
38250	Instruments to measure electricity, n.s.k.	424.7	246.7	263.4	281.8	196.8	200.5	127.9	67.8
3826-	Analytical instruments	3 156.6	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)
38260	Analytical and scientific instruments, except optical	3 156.6	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)
3827-	Optical instruments and lenses	1 990.2	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)
38271	Sighting, tracking, and fire control equipment, optical type	729.4	531.7	624.3	565.2	515.3	505.4	227.3	83.1
38272	Binoculars and astronomical instruments	36.3							(NA)
38273	Optical instruments and lenses, n.e.c.	1 169.6	1 326.3	1 401.8	1 406.5	1 033.0	922.8	390.0	(NA)
38270	Optical instruments and lenses, n.s.k.	54.8	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)
3829-	Measuring and controlling devices, n.e.c.	3 389.3	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)
38291	Aircraft engine instruments, except flight	510.1	534.0	428.3	355.5	327.3	311.0	120.1	74.5
38292	Physical properties and kinematic testing and inspection equipment	906.4	756.4	721.1	676.1	542.0	635.2	276.6	106.3
38294	Nuclear radiation detection and monitoring instruments	645.0	640.9	604.7	546.5	584.2	596.4	344.2	198.2
38295	Commercial, geophysical, meteorological, and general purpose instruments and equipment	891.5	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)
38296	Surveying and drafting instruments and associated equipment	230.2	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)
38290	Measuring and controlling devices, n.e.c., n.s.k.	206.2	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)

¹Figures are estimates derived from a representative sample of manufacturing establishments. Standard errors associated with estimates are published in annual survey of manufactures publications for this period.

Table 7. Materials Consumed by Kind: 1987 and 1982

[Includes quantity and cost of materials consumed or put into production by establishments classified only in this industry. For further explanation, see Cost of Materials in appendixes. For meaning of abbreviations and symbols, see introductory text]

1987 material code	Material	1987		1982	
		Quantity ¹	Delivered cost (million dollars)	Quantity ¹	Delivered cost (million dollars)
	INDUSTRY 3812, SEARCH AND NAVIGATION EQUIPMENT				
	Materials, parts, containers, and supplies	(X)	³ 10 476.5	(X)	(³)
	Mill shapes and forms, except castings and forgings:				
331001	Carbon steel 1,000 s tons	(S)	87.5	(NA)	(NA)
331020	Alloy steel (except stainless) do	**34.1	91.5	(NA)	(NA)
331031	Stainless steel do	(S)	6.9	(NA)	(NA)
	Copper and copper-base alloy:				
335728	Bare wire (for electrical conduction only) mil lb	(S)	5.3	(NA)	(NA)
335102	Rod, bar, and mechanical wire, including extruded and/or drawn shapes do	(S)	1.0	(NA)	(NA)
335143	Plate, sheet, and strip, including military cups and discs do	(S)	1.5	(NA)	(NA)
335152	Pipe and tube do	(S)	1.2	(NA)	(NA)
	Aluminum and aluminum-base alloy:				
335301	Sheet, plate, and foil mil lb	(S)	14.0	(NA)	(NA)
335405	Extruded shapes, including extruded rod, bar, pipe, tube, etc. do	(S)	7.5	(NA)	(NA)
335008	All other aluminum mill shapes and forms (wire, rolled rod and bar, powder, welded tubing, etc.) do	*21.5	65.7	(NA)	(NA)
	Castings (rough and semifinished):				
332012	Iron (gray and malleable) and steel 1,000 s tons	(S)	41.7	(NA)	(NA)
336005	Aluminum and aluminum-base alloy mil lb	(S)	78.8	(NA)	(NA)
336003	Other nonferrous do	(S)	9.3	(NA)	(NA)
367004	Resistors, capacitors, transformers, electron tubes, semiconductors, and other electronic-type components	(X)	1 897.6	(NA)	(NA)
265001	Paperboard containers, boxes, and corrugated paperboard	(X)	16.5	(NA)	(NA)
320101	Glass and glass products, excluding windows and mirrors	(X)	2.4	(NA)	(NA)

See footnotes at end of table.

Table 7. Materials Consumed by Kind: 1987 and 1982—Con.

[Includes quantity and cost of materials consumed or put into production by establishments classified only in this industry. For further explanation, see Cost of Materials in appendixes. For meaning of abbreviations and symbols, see introductory text]

1987 material code	Material	1987		1982	
		Quantity ¹	Delivered cost (million dollars)	Quantity ¹	Delivered cost (million dollars)
	INDUSTRY 3812, SEARCH AND NAVIGATION EQUIPMENT—Con.				
	Bearings, including mounted and unmounted:				
356218	Ball	(X)	10.6	(NA)	(NA)
356201	Roller	(X)	2.4	(NA)	(NA)
364300	Current-carrying wiring devices	(X)	83.9	(NA)	(NA)
382501	Electrical instrument mechanisms and meter movements, including instrument relays	(X)	208.8	(NA)	(NA)
282104	Plastics resins consumed in the form of granules, pellets, powders, liquids, etc., excluding sheets, rods, tubes, and shapes	(S)	16.0	(NA)	(NA)
344401	Sheet metal products, except stampings	(X)	125.2	(NA)	(NA)
345001	Bolts, nuts, screws, washers, rivets, and screw machine products	(X)	94.1	(NA)	(NA)
346901	Metal stampings	(X)	29.2	(NA)	(NA)
308006	Fabricated plastics products, except gaskets, hose, and belting	(X)	37.6	(NA)	(NA)
357004	Electronic computing equipment and parts	(X)	423.5	(NA)	(NA)
970099	All other materials and components, parts, containers, and supplies	(X)	4 940.0	(NA)	(NA)
971000	Materials, parts, containers, and supplies, n.s.k. ²	(X)	2 176.8	(NA)	(NA)
	INDUSTRY 3821, LABORATORY APPARATUS AND FURNITURE				
	Materials, parts, containers, and supplies	(X)	3526.1	(X)	(³)
	Mill shapes and forms, except castings and forgings:				
	Carbon steel:				
331011	Bars and bar shapes	(S)	3.3	(NA)	(NA)
331012	Sheet and strip	(S)	16.4	(NA)	(NA)
331013	Plates	(D)	(⁴)	(NA)	(NA)
331015	Structural shapes	(S)	1.7	(NA)	(NA)
331017	Wire and wire products	(D)	(⁴)	(NA)	(NA)
331019	All other carbon steel mill shapes and forms	(S)	44.5	(NA)	(NA)
	Alloy steel, except stainless:				
331021	Bars and bar shapes	(S)	(⁵)	(NA)	(NA)
331029	All other alloy steel mill shapes and forms	(D)	(⁵)	(NA)	(NA)
	Stainless steel:				
331033	Sheet and strip	(S)	10.9	(NA)	(NA)
331050	All other stainless steel mill shapes and forms	(S)	5.4	(NA)	(NA)
	Copper and copper-base alloy:				
335728	Bare wire (for electrical conduction only)	(S)	(⁵)	(NA)	(NA)
335102	Rod, bar, and mechanical wire, including extruded and/ or drawn shapes	(S)	(⁵)	(NA)	(NA)
335143	Plate, sheet, and strip, including military cups and discs	(S)	.1	(NA)	(NA)
335152	Pipe and tube	(S)	2.2	(NA)	(NA)
	Aluminum and aluminum-base alloy:				
335301	Sheet, plate, and foil	(S)	1.2	(NA)	(NA)
335405	Extruded shapes, including extruded rod, bar, pipe, tube, etc.	(S)	1.3	(NA)	(NA)
335008	All other aluminum mill shapes and forms (wire, rolled rod and bar, powder, welded tubing, etc.)	(S)	1.2	(NA)	(NA)
335792	Insulated copper wire and cable, except magnet wire (quantity of copper content)	(S)	(Z)	(NA)	(NA)
	Castings (rough and semifinished):				
332011	Iron (gray and malleable)	(S)	.2	(NA)	(NA)
332045	Steel	(D)	(⁵)	(NA)	(NA)
336005	Aluminum and aluminum-base alloy	(S)	1.9	(NA)	(NA)
336006	Copper and copper-base alloy	(S)	.1	(NA)	(NA)
336008	Other nonferrous	(S)	.4	(NA)	(NA)
	Fractional horsepower electric motors and generators (less than 1 hp):				
362110	Timing motors, synchronous and subsynchronous	(S)	1.2	(NA)	(NA)
362115	Other fractional horsepower electric motors, and generators (excluding timing motors)	(S)	4.1	(NA)	(NA)
	Bearings, including mounted and unmounted:				
356218	Ball	(X)	2.1	(NA)	(NA)
356201	Roller	(X)	.1	(NA)	(NA)
367004	Resistors, capacitors, transformers, electron tubes, semiconductors, and other electronic-type components	(X)	18.2	(NA)	(NA)
344401	Sheet metal products, except stampings	(X)	11.0	(NA)	(NA)
345001	Bolts, nuts, screws, washers, rivets, and screw machine products	(X)	4.4	(NA)	(NA)
364300	Current-carrying wiring devices	(X)	2.3	(NA)	(NA)
282104	Plastics resins consumed in the form of granules, pellets, powders, liquids, etc., excluding sheets, rods, tubes, and shapes	(S)	4.7	(NA)	(NA)
349012	Fabricated wire products	(X)	1.0	(NA)	(NA)
308006	Fabricated plastics products, except gaskets	(X)	4.9	(NA)	(NA)
320101	Glass and glass products, excluding windows and mirrors	(X)	3.3	(NA)	(NA)
346901	Metal stampings	(X)	1.4	(NA)	(NA)
382501	Electrical instrument mechanisms and meter movements, including instrument relays	(X)	5.5	(NA)	(NA)
382591	Electrical measuring instruments and parts, n.e.c.	(X)	2.9	(NA)	(NA)
360101	Electric transmission, distribution, and control equipment	(X)	3.1	(NA)	(NA)
357001	Electronic computing equipment and parts	(X)	7.2	(NA)	(NA)
260003	Paper and paperboard products (except paperboard boxes, containers, and corrugated paperboard)	(S)	3.4	(NA)	(NA)
265001	Paperboard containers, boxes, and corrugated paperboard	(S)	6.2	(NA)	(NA)
970099	All other materials and components, parts, containers, and supplies	(X)	5228.8	(NA)	(NA)
971000	Materials, parts, containers, and supplies, n.s.k. ²	(X)	159.5	(NA)	(NA)

See footnotes at end of table.

Table 7. Materials Consumed by Kind: 1987 and 1982—Con.

[Includes quantity and cost of materials consumed or put into production by establishments classified only in this industry. For further explanation, see Cost of Materials in appendixes. For meaning of abbreviations and symbols, see introductory text]

1987 material code	Material	1987		1982		
		Quantity ¹	Delivered cost (million dollars)	Quantity ¹	Delivered cost (million dollars)	
	INDUSTRY 3822, ENVIRONMENTAL CONTROLS					
	Materials, parts, containers, and supplies -----	(X)	667.0	(X)	463.9	
	Mill shapes and forms, except castings and forgings:					
	Carbon steel:					
331011	Bars and bar shapes ----- 1,000 s tons..	(S)	.7	(S)	4.7	
331012	Sheet and strip ----- do..	(S)	10.6	*14.3	7.5	
331013	Plates ----- do..	}				
331015	Structural shapes ----- do..					
331017	Wire and wire products ----- do..		(S)	3.7	(S)	11.8
331019	All other carbon steel mill shapes and forms ----- do..					
	Alloy steel, except stainless:					
331021	Bars and bar shapes ----- 1,000 s tons..	(S)	.1	}	(S)	
331029	All other alloy steel mill shapes and forms ----- do..	(S)	3.6			
	Stainless steel:					
331033	Sheet and strip ----- 1,000 s tons..	(S)	6.0	(S)	3.5	
331050	All other stainless steel mill shapes and forms ----- do..	(S)	4.4	(S)	5.4	
	Copper and copper-base alloy:					
335728	Bare wire for electrical conduction only ----- mil lb..	(S)	3.2	1.3	2.1	
335102	Rod, bar, and mechanical wire, including extruded and/ or drawn shapes ----- do..	19.7	10.3	**7.0	6.7	
335143	Plate, sheet, and strip, including military cups and discs ----- do..	(S)	5.8	(S)	3.3	
335152	Pipe and tube ----- do..	2.7	4.5	**2.9	4.8	
	Aluminum and aluminum-base alloy:					
335301	Sheet, plate, and foil ----- mil lb..	(S)	6.3	}	*5.4	
335405	Extruded shapes, including extruded rod, bar, pipe, tube, etc. ----- do..	8.3	4.6			
335008	All other aluminum and aluminum-alloy mill shapes and forms (wire, rolled rod and bar, powder, welded tubing, etc.) ----- do..	(S)	3.5	.6	.6	
335792	Insulated copper wire and cable, except magnet wire (quantity of copper content) ----- do..	(S)	1.2	**3.6	4.5	
	Castings (rough and semifinished):					
332011	Iron (gray and malleable) ----- 1,000 s tons..	(D)	(⁵)	(D)	(⁶)	
332045	Steel ----- do..	(D)	(⁵)	(D)	(⁶)	
336005	Aluminum and aluminum-base alloy ----- mil lb..	*18.7	9.1	**11.8	6.9	
336006	Copper and copper-base alloy ----- do..	(S)	2.2	**1.5	1.4	
336008	Other nonferrous ----- do..	(D)	(⁵)	(S)	⁶ 4.8	
	Fractional horsepower electric motors and generators (less than 1 hp):					
362110	Timing motors, synchronous and subsynchronous ----- thousands..	5 362.5	10.1	(D)	(⁷)	
362115	All other fractional horsepower electric motors and generators, excluding timing motors ----- do..	(D)	(⁵)	(S)	75.9	
	Bearings, including mounted and unmounted:					
356218	Ball -----	}	.2	(X)	-	
356201	Roller -----			(X)	-	
367004	Resistors, capacitors, transformers, electron tubes, semiconductors, and other electronic-type components -----	(X)	70.5	(X)	36.7	
344401	Sheet metal products, except stampings -----	(X)	5.0	(X)	3.2	
345001	Bolts, nuts, screws, washers, rivets, and screw machine products -----	(X)	34.8	(X)	20.1	
364300	Current-carrying wiring devices -----	(X)	6.4	(X)	5.4	
282104	Plastics resins consumed in the form of granules, pellets, powders, liquids, etc., excluding sheets, rods, tubes, and shapes ----- mil lb..	(S)	12.2	(NA)	5.1	
349012	Fabricated wire products -----	(X)	2.3	(X)	5.4	
308006	Fabricated plastics products, except gaskets -----	(X)	14.4	(X)	10.9	
320101	Glass and glass products, excluding windows and mirrors -----	(X)	1.5	(X)	.3	
346901	Metal stampings -----	(X)	27.6	(X)	21.5	
382501	Electrical instrument mechanisms and meter movements, including instrument relays -----	(X)	5.1	(X)	8.0	
382591	Electrical measuring instruments and parts, n.e.c. -----	(X)	2.2	(X)	.7	
360101	Electric transmission, distribution, and control equipment -----	(X)	6.8	(X)	5.2	
357001	Electronic computing equipment and parts -----	(X)	12.4	(X)	7.8	
260003	Paper and paperboard products (except paperboard boxes, containers, and corrugated paperboard) ----- 1,000 s tons..	(S)	1.5	(S)	.5	
265001	Paperboard containers, boxes, and corrugated paperboard ----- do..	(S)	7.5	(S)	4.3	
970099	All other materials and components, parts, containers, and supplies -----	(X)	⁵ 185.9	(X)	189.6	
971000	Materials, parts, containers, and supplies, n.s.k. ² -----	(X)	180.8	(X)	56.7	
	INDUSTRY 3823, PROCESS CONTROL INSTRUMENTS					
	Materials, parts, containers, and supplies -----	(X)	1 427.5	(X)	1 026.0	
	Mill shapes and forms, except castings and forgings:					
	Carbon steel:					
331011	Bars and bar shapes ----- 1,000 s tons..	(S)	6.7	(S)	4.1	
331012	Sheet and strip ----- do..	(S)	2.3	**7.2	4.0	
331013	Plates ----- do..	(S)	.4	(S)	.8	
331015	Structural shapes ----- do..	(S)	4.1	*.9	.5	
331017	Wire and wire products ----- do..	(S)	1.1	(S)	2.7	
331019	All other carbon steel mill shapes and forms ----- do..	**4.3	3.1	(S)	2.5	
	Alloy steel, except stainless:					
331021	Bars and bar shapes ----- 1,000 s tons..	(S)	2.5	(S)	2.8	
331029	All other alloy steel mill shapes and forms ----- do..	(S)	5.7	(S)	3.2	
	Stainless steel:					
331033	Sheet and strip ----- 1,000 s tons..	(S)	4.7	(S)	3.3	
331050	All other stainless steel mill shapes and forms ----- do..	(S)	21.1	(S)	17.7	

See footnotes at end of table.

Table 7. **Materials Consumed by Kind: 1987 and 1982—Con.**

[Includes quantity and cost of materials consumed or put into production by establishments classified only in this industry. For further explanation, see Cost of Materials in appendixes. For meaning of abbreviations and symbols, see introductory text]

1987 material code	Material	1987		1982	
		Quantity ¹	Delivered cost (million dollars)	Quantity ¹	Delivered cost (million dollars)
	INDUSTRY 3823, PROCESS CONTROL INSTRUMENTS—Con.				
	Mill shapes and forms, except castings and forgings—Con.				
	Copper and copper-base alloy:				
335728	Bare wire for electrical conductions only mil lb..	(S)	5.6	}	(S) 6.7
335102	Rod, bar, and mechanical wire, including extruded and/ or drawn shapes do..	(S)	3.7		
335143	Plate, sheet, and strip, including military cups and discs do..	(S)	.4		
335152	Pipe and tube do..	(S)	3.9		
	Aluminum and aluminum-base alloy:				
335301	Sheet, plate, and foil mil lb..	(S)	1.2	(S)	1.3
335405	Extruded shapes, including extruded rod, bar, pipe, tube, etc. do..	(S)	6.4	(S)	3.8
335008	All other aluminum mill shapes and forms (wire, rolled rod and bar, powder, welded tubing, etc.) do..	(S)	7.6	(S)	.8
335792	Insulated copper wire and cable, except magnet wire (quantity of copper content) do..	1.9	3.2	(S)	3.9
	Castings (rough and semifinished):				
332011	Iron (gray and malleable) 1,000 s tons..	**4.6	7.3	(S)	7.2
332045	Steel do..	(S)	12.1	**6.2	15.9
336005	Aluminum and aluminum-base alloy mil lb..	(S)	16.4	(S)	16.3
336006	Copper and copper-base alloy do..	(S)	1.9	*4.9	5.5
336008	Other nonferrous do..	(S)	4.1	**1.5	2.3
	Fractional horsepower electric motors and generators (less than 1 hp):				
362110	Timing motors, synchronous and subsynchronous millions..	(S)	4.3	(S)	5.2
362115	Other fractional horsepower electric motors, excluding timing motors do..	(S)	2.6	(S)	4.8
	Bearings, including mounted and unmounted:				
356218	Ball do..	}	(X) 1.8	(X)	2.2
356201	Roller do..			(X)	2.0
367004	Resistors, capacitors, transformers, electron tubes, semiconductors, and other electronic-type components do..	(X)	179.7	(X)	104.5
344401	Sheet metal products, except stampings do..	(X)	39.3	(X)	21.0
345001	Bolts, nuts, screws, washers, rivets, and screw machine products do..	(X)	17.9	(X)	17.4
364300	Current-carrying wiring devices do..	(X)	8.6	(X)	11.7
282104	Plastics resins consumed in the form of granules, pellets, powders, liquids, etc., excluding sheets, rods, tubes, and shapes mil lb..	(D)	(⁹)	(NA)	2.8
349012	Fabricated wire products do..	(X)	11.6	(X)	2.9
308006	Fabricated plastics products, except gaskets do..	(X)	23.0	(X)	7.8
320101	Glass and glass products, excluding windows and mirrors do..	(X)	8.1	(X)	6.9
346901	Metal stampings do..	(X)	14.2	(X)	12.8
382501	Electrical instrument mechanisms and meter movements, including instrument relays do..	(X)	49.9	(X)	22.3
382591	Electrical measuring instruments and parts, n.e.c. do..	(X)	53.6	(X)	40.5
360101	Electric transmission, distribution, and control equipment do..	(X)	6.3	(X)	8.2
357001	Electronic computing equipment and parts do..	(X)	54.6	(X)	21.1
260003	Paper and paperboard products (except paperboard boxes, containers, and corrugated paperboard) 1,000 s tons..	(S)	19.6	(S)	5.1
265001	Paperboard containers, boxes, and corrugated paperboard do..	(S)	8.2	(S)	15.1
970099	All other materials and components, parts, containers, and supplies do..	(X)	⁵ 286.2	(X)	259.8
971000	Materials, parts, containers, and supplies, n.s.k. ² do..	(X)	512.5	(X)	342.4
	INDUSTRY 3824, FLUID METERS AND COUNTING DEVICES				
	Materials, parts, containers, and supplies do..	(X)	346.0	(X)	247.1
	Mill shapes and forms, except castings and forgings:				
	Carbon steel:				
331011	Bars and bar shapes 1,000 s tons..	(S)	.9	(S)	1.5
331012	Sheet and strip do..	(S)	1.1	(S)	1.4
331013	Plates do..	}	**1.2	(S)	.8
331015	Structural shapes do..				
331017	Wire and wire products do..				
331019	All other carbon steel mill shapes and forms do..				
	Alloy steel, except stainless:				
331021	Bars and bar shapes 1,000 s tons..	(S)	.2	(S)	.2
331029	All other alloy steel mill shapes and forms do..	(Z)	(Z)	-	-
	Stainless steel:				
331033	Sheet and strip 1,000 s tons..	(S)	.2	**1	.5
331050	All other stainless steel mill shapes and forms do..	(S)	1.2	(S)	1.0
	Copper and copper-base alloy:				
335728	Bare wire for electrical conduction only mil lb..	(D)	(D)	.1	.2
335102	Rod, bar, and mechanical wire, including extruded and/ or drawn shapes do..	(S)	.3	(S)	4.1
335143	Plate, sheet, and strip, including military cups and discs do..	(S)	.4	(S)	.7
335152	Pipe and tube do..	(D)	(D)	(D)	(⁹)
	Aluminum and aluminum-base alloy:				
335301	Sheet, plate, and foil mil lb..	(S)	.8	*.9	.7
335405	Extruded shapes, including extruded rod, bar, pipe, tube, etc. do..	*.4	.9	*.3	1.0
335008	All other aluminum mill shapes and forms (wire, rolled rod and bar, powder, welded tubing, etc.) do..	(S)	.1	(S)	.2
335792	Insulated copper wire and cable, except magnet wire (quantity of copper content) do..	(S)	.2	(D)	(⁹)

See footnotes at end of table.

Table 7. Materials Consumed by Kind: 1987 and 1982—Con.

[Includes quantity and cost of materials consumed or put into production by establishments classified only in this industry. For further explanation, see Cost of Materials in appendixes. For meaning of abbreviations and symbols, see introductory text]

1987 material code	Material	1987		1982	
		Quantity ¹	Delivered cost (million dollars)	Quantity ¹	Delivered cost (million dollars)
	INDUSTRY 3824, FLUID METERS AND COUNTING DEVICES—Con.				
332011	Castings (rough and semifinished):				
332045	Iron (gray and malleable) ----- 1,000 s tons..	(S)	8.9	**5.1	8.4
336005	Steel ----- do..	(D)	(D)	(S)	1.3
336006	Aluminum and aluminum-base alloy ----- mil lb..	11.0	27.5	*9.0	20.4
336008	Copper and copper-base alloy ----- do..	(S)	11.5	(S)	12.1
	Other nonferrous ----- do..	(D)	(D)	(D)	(⁵)
362110	Fractional horsepower electric motors and generators (less than 1 hp):				
362115	Timing motors, synchronous and subsynchronous ----- millions..	(Z)	(Z)	(S)	1.1
	Other fractional horsepower electric motors and generators, excluding timing motors ----- do..	(S)	.1		
356218	Bearings, including mounted and unmounted:				
356201	Ball -----]	(X)	1.6	(X)	1.4
367004	Roller -----]				
	Resistors, capacitors, transformers, electron tubes, semiconductors, and other electronic-type components -----	(X)	16.2	(S)	13.6
344401	Sheet metal products, except stampings -----	(X)	1.2	(X)	1.0
345001	Bolts, nuts, screws, washers, rivets, and screw machine products -----	(X)	14.7	(X)	12.5
364300	Current-carrying wiring devices -----	(X)	(D)	(X)	1.0
282104	Plastics resins consumed in the form of granules, pellets, powders, liquids, etc., excluding sheets, rods, tubes, and shapes ----- mil lb..	(S)	10.1	(S)	7.5
349012	Fabricated wire products -----	(X)	1.8	(X)	1.3
308006	Fabricated plastics products, except gaskets -----	(X)	11.5	(X)	5.5
320101	Glass and glass products, excluding windows and mirrors -----	(X)	2.8	(X)	1.5
346901	Metal stampings -----	(X)	9.3	(X)	5.8
382501	Electrical instrument mechanisms and meter movements, including instrument relays -----	(X)	10.0	(X)	1.7
382591	Electrical measuring instruments and parts, n.e.c. -----	(X)	12.0	(X)	2.4
360101	Electric transmission, distribution, and control equipment -----	(X)	(D)		
357001	Electronic computing equipment and parts -----	(X)	2.6		
260003	Paper and paperboard products (except paperboard boxes, containers, and corrugated paperboard) ----- 1,000 s tons..	(D)	(D)	(S)	.1
265001	Paperboard containers, boxes, and corrugated paperboard ----- do..	(S)	3.1	(S)	2.5
970099	All other materials and components, parts, containers, and supplies -----	(X)	145.3	(X)	⁵ 90.8
971000	Materials, parts, containers, and supplies, n.s.k. ² -----	(X)	48.5	(X)	42.9
	INDUSTRY 3825, INSTRUMENTS TO MEASURE ELECTRICITY				
	Materials, parts, containers, and supplies -----	(X)	2 265.3	(X)	1 576.0
	Mill shapes and forms, except castings and forgings:				
	Carbon steel:				
331011	Bars and bar shapes ----- 1,000 s tons..	(S)	3.0	(S)	1.6
331012	Sheet and strip ----- do..	2.5	3.4	(S)	8.7
331013	Plates ----- do..	(S)	.1	(S)	.5
331015	Structural shapes ----- do..	(S)	(⁸)	(S)	.1
331017	Wire and wire products ----- do..	(D)	(⁸)	(S)	.9
331019	All other carbon steel mill shapes and forms ----- do..	(D)	⁸ 2.5		
331021	Alloy steel, except stainless:				
331029	Bars and bar shapes ----- 1,000 s tons..	(S)	1.3	*1.1	.5
	All other steel mill shapes and forms ----- do..	*4.7	5.1	3.2	3.6
331033	Stainless steel:				
331050	Sheet and strip ----- 1,000 s tons..	**1.1	3.2	**7	1.5
	All other stainless steel mill shapes and forms ----- do..	(S)	1.7	(S)	1.8
335728	Copper and copper-base alloy:				
335102	Bare wire for electrical conduction only ----- mil lb..	(S)	5.3	**5.6	5.2
	Rod, bar, and mechanical wire, including extruded and/ or drawn shapes ----- do..	(S)	4.6	*3.7	4.6
335143	Plate, sheet, and strip, including military cups and discs ----- do..	(S)	2.7	(S)	3.5
335152	Pipe and tube ----- do..	(S)		(S)	.2
335301	Aluminum and aluminum-base alloy:				
335405	Sheet, plate, and foil ----- mil lb..	(S)	19.2	**6.0	8.0
	Extruded shapes, including extruded rod, bar, pipe, tube, etc. ----- do..	(S)	6.6	**2.8	3.5
335008	All other aluminum mill shapes and forms (wire, rolled rod and bar, powder, welded tubing, etc.) ----- do..	(S)	2.5	*8.9	5.1
335792	Insulated copper wire and cable, except magnet wire (quantity of copper content) ----- do..	(S)	3.3	(S)	10.1
332011	Castings (rough and semifinished):				
332045	Iron (gray and malleable) ----- 1,000 s tons..	(S)	.2	(D)	(D)
336005	Steel ----- do..	(D)	(⁵)	(D)	(D)
336006	Aluminum and aluminum-base alloy ----- mil lb..	(S)	8.7	(S)	6.9
336008	Copper and copper-base alloy ----- do..	(D)	(⁵)	(S)	(D)
	Other nonferrous ----- do..	(S)	6.3	(S)	.6
362110	Fractional horsepower electric motors and generators (less than 1 hp):				
362115	Timing motors, synchronous and subsynchronous ----- millions..	(S)	4.0	(S)	4.6
	Other fractional horsepower electric motors and generators, excluding timing motors ----- do..	(S)	1.7	(S)	4.4
356218	Bearings, including mounted and unmounted:				
356201	Ball -----	(X)	.9	(X)	2.4
367004	Roller -----	(X)	.3	(X)	.4
	Resistors, capacitors, transformers, electron tubes, semiconductors, and other electronic-type components -----	(X)	596.6	(X)	370.1
344401	Sheet metal products, except stampings -----	(X)	58.8	(X)	34.9
345001	Bolts, nuts, screws, washers, rivets, and screw machine products -----	(X)	25.9	(X)	22.5

See footnotes at end of table.

Table 7. Materials Consumed by Kind: 1987 and 1982—Con.

[Includes quantity and cost of materials consumed or put into production by establishments classified only in this industry. For further explanation, see Cost of Materials in appendixes. For meaning of abbreviations and symbols, see introductory text]

1987 material code	Material	1987		1982	
		Quantity ¹	Delivered cost (million dollars)	Quantity ¹	Delivered cost (million dollars)
	INDUSTRY 3825, INSTRUMENTS TO MEASURE ELECTRICITY—Con.				
364300	Current-carrying wiring devices	(X)	35.1	(X)	21.8
282104	Plastics resins consumed in the form of granules, pellets, powders, liquids, etc., excluding sheets, rods, tubes, and shapes mil lb..	(S)			
349012	Fabricated wire products	(X)	25.0	(S)	8.0
308006	Fabricated plastics products, except gaskets.....	(X)	20.7	(X)	6.1
320101	Glass and glass products, excluding windows and mirrors	(X)	17.0	(X)	13.2
346901	Metal stampings	(X)	13.5	(X)	12.7
382501	Electrical instrument mechanisms and meter movements, including instrument relays	(X)	15.4	(X)	10.8
382591	Electrical measuring instruments and parts, n.e.c.	(X)	74.1	(X)	82.7
360101	Electric transmission, distribution, and control equipment	(X)	106.8	(X)	150.4
357001	Electronic computing equipment and parts	(X)	35.6	(X)	8.3
260003	Paper and paperboard products, except paperboard boxes, containers, and corrugated paperboard..... 1,000 s tons..	(X)	64.0	(X)	56.1
265001	Paperboard containers, boxes, and corrugated paperboard	(S)	21.2	(S)	7.5
970099	All other materials and components, parts, containers, and supplies.....	(S)	13.5	(S)	11.0
971000	Materials, parts, containers, and supplies, n.s.k. ²	(X)	⁵ 339.7	(X)	390.3
		(X)	715.8	(X)	287.7
	INDUSTRY 3826, ANALYTICAL INSTRUMENTS				
	Materials, parts, containers, and supplies	(X)	³¹ 201.5	(X)	(³)
	Mill shapes and forms, except castings and forgings:				
	Carbon steel:				
331011	Bars and bar shapes 1,000 s tons..	(S)	2.1	(NA)	(NA)
331012	Sheet and strip do..	(S)	1.3	(NA)	(NA)
331013	Plates do..	(D)	(⁹)	(NA)	(NA)
331015	Structural shapes do..	(S)	.4	(NA)	(NA)
331017	Wire and wire products do..	(S)	.1	(NA)	(NA)
331019	All other carbon steel mill shapes and forms..... do..	(D)	9.7	(NA)	(NA)
	Alloy steel, except stainless:				
331021	Bars and bar shapes 1,000 s tons..	(S)	5.3	(NA)	(NA)
331029	All other alloy steel mill shapes and forms..... do..	(S)		(NA)	(NA)
	Stainless steel:				
331033	Sheet and strip 1,000 s tons..	(S)	3.3	(NA)	(NA)
331050	All other stainless steel mill shapes and forms	(S)	3.0	(NA)	(NA)
	Copper and copper-base alloy:				
335728	Bare wire (for electrical conduction only) mil lb..			(NA)	(NA)
335102	Rod, bar, and mechanical wire, including extruded and/ or drawn shapes do..	(S)	4.9	(NA)	(NA)
335143	Plate, sheet, and strip, including military cups and discs..... do..			(NA)	(NA)
335152	Pipe and tube do..			(NA)	(NA)
	Aluminum and aluminum-base alloy:				
335301	Sheet, plate, and foil mil lb..	(S)	3.7	(NA)	(NA)
335405	Extruded shapes, including extruded rod, bar, pipe, tube, etc. do..	(S)	2.1	(NA)	(NA)
335008	All other aluminum mill shapes and forms (wire, rolled rod and bar, powder, welded tubing, etc.) do..	(S)	.5	(NA)	(NA)
335792	Insulated copper wire and cable, except magnet wire (quantity of copper content)..... do..	(S)	.1	(NA)	(NA)
	Castings (rough and semifinished):				
332011	Iron (gray and malleable) 1,000 s tons..	(D)	(⁵)	(NA)	(NA)
332045	Steel do..	(D)	(⁵)	(NA)	(NA)
336005	Aluminum and aluminum-base alloy mil lb..	4.4	7.1	(NA)	(NA)
336006	Copper and copper-base alloy do..	(D)	(⁵)	(NA)	(NA)
336008	Other nonferrous do..	-	-	(NA)	(NA)
	Fractional horsepower electric motors and generators (less than 1 hp):				
362110	Timing motors, synchronous and subsynchronous millions..	(S)	5.2	(NA)	(NA)
362115	Other fractional horsepower electric motors and generators, excluding timing motors..... do..	(S)	5.1	(NA)	(NA)
	Bearings, including mounted and unmounted:				
356218	Ball	(X)	.5	(NA)	(NA)
356201	Roller.....	(X)	.1	(NA)	(NA)
367004	Resistors, capacitors, transformers, electron tubes, semiconductors, and other electronic-type components	(X)	70.5	(NA)	(NA)
344401	Sheet metal products, except stampings	(X)	15.1	(NA)	(NA)
345001	Bolts, nuts, screws, washers, rivets, and screw machine products	(X)	9.2	(NA)	(NA)
364300	Current-carrying wiring devices	(X)	1.9	(NA)	(NA)
282104	Plastics resins consumed in the form of granules, pellets, powders, liquids, etc., excluding sheets, rods, tubes, and shapes mil lb..	(S)	1.9	(NA)	(NA)
349012	Fabricated wire products	(X)	2.8	(NA)	(NA)
308006	Fabricated plastics products, except gaskets.....	(X)	13.1	(NA)	(NA)
320101	Glass and glass products, excluding windows and mirrors	(X)	8.6	(NA)	(NA)
346901	Metal stampings	(X)	4.1	(NA)	(NA)
382501	Electrical instrument mechanisms and meter movements, including instrument relays	(X)	6.8	(NA)	(NA)
382591	Electrical measuring instruments and parts, n.e.c.	(X)	38.1	(NA)	(NA)
360101	Electric transmission, distribution, and control equipment	(X)	.6	(NA)	(NA)
357001	Electronic computing equipment and parts	(X)	18.4	(NA)	(NA)
260003	Paper and paperboard products, except paperboard boxes, containers, and corrugated paperboard..... 1,000 s tons..	(S)	1.3	(NA)	(NA)
265001	Paperboard containers, boxes, and corrugated paperboard	(S)	3.7	(NA)	(NA)
970099	All other materials and components, parts, containers, and supplies.....	(X)	⁵ 389.0	(NA)	(NA)
971000	Materials, parts, containers, and supplies, n.s.k. ²	(X)	570.9	(NA)	(NA)

See footnotes at end of table.

Table 7. **Materials Consumed by Kind: 1987 and 1982—Con.**

[Includes quantity and cost of materials consumed or put into production by establishments classified only in this industry. For further explanation, see Cost of Materials in appendixes. For meaning of abbreviations and symbols, see introductory text]

1987 material code	Material	1987		1982	
		Quantity ¹	Delivered cost (million dollars)	Quantity ¹	Delivered cost (million dollars)
INDUSTRY 3827, OPTICAL INSTRUMENTS AND LENSES					
	Materials, parts, containers, and supplies -----	(X)	³ 589.2	(X)	(³)
	Mill shapes and forms, except castings and forgings:				
	Carbon steel:				
331011	Bars and bar shapes ----- 1,000 s tons..	(S)	2.8	(NA)	(NA)
331012	Sheet and strip ----- do..			(NA)	(NA)
331013	Plates ----- do..			(NA)	(NA)
331015	Structural shapes ----- do..			(NA)	(NA)
331017	Wire and wire products ----- do..			(NA)	(NA)
331019	All other carbon steel mill shapes and forms ----- do..			(NA)	(NA)
	Alloy steel, except stainless:				
331021	Bars and bar shapes ----- 1,000 s tons..	(S)	.2	(NA)	(NA)
331029	All other alloy steel mill shapes and forms ----- do..			(NA)	(NA)
	Stainless steel:				
331033	Sheet and strip ----- 1,000 s tons..	(D)	(D)	(NA)	(NA)
331050	All other stainless steel mill shapes and forms ----- do..	(D)	(D)	(NA)	(NA)
	Copper and copper-base alloy:				
335728	Bare wire (for electrical conduction only) ----- mil lb..	(S)	.7	(NA)	(NA)
335102	Rod, bar, and mechanical wire, including extruded and/ or drawn shapes ----- do..			(NA)	(NA)
335143	Plate, sheet, and strip, including military cups and discs ----- do..			(NA)	(NA)
335152	Pipe and tube ----- do..	-	-	(NA)	(NA)
	Aluminum and aluminum-base alloy:				
335301	Sheet, plate, and foil ----- mil lb..	(S)	.4	(NA)	(NA)
335405	Extruded shapes, including extruded rod, bar, pipe, tube, etc. ----- do..	(S)	1.3	(NA)	(NA)
335008	All other aluminum mill shapes and forms (wire, rolled rod and bar, powder, welded tubing, etc.) ----- do..	(S)	1.4	(NA)	(NA)
335792	Insulated copper wire and cable, except magnet wire (quantity of copper content) ----- do..	-	-	(NA)	(NA)
	Castings (rough and semifinished):				
332011	Iron (gray and malleable) ----- 1,000 s tons..	(S)	.1	(NA)	(NA)
332045	Steel ----- do..	(S)	.2	(NA)	(NA)
336005	Aluminum and aluminum-base alloy ----- mil lb..	(S)	5.1	(NA)	(NA)
336006	Copper and copper-base alloy ----- do..	(S)	.3	(NA)	(NA)
336008	Other nonferrous ----- do..	(S)	.1	(NA)	(NA)
	Fractional horsepower electric motors and generators (less than 1 hp):				
362110	Timing motors, synchronous and subsynchronous ----- millions..	(D)	(D)	(NA)	(NA)
362115	Other fractional horsepower electric motors and generators, excluding timing motors ----- do..	(S)	1.3	(NA)	(NA)
	Bearings, including mounted and unmounted:				
356218	Ball -----	(X)	.5	(NA)	(NA)
356201	Roller -----	(X)	.1	(NA)	(NA)
367004	Resistors, capacitors, transformers, electron tubes, semiconductors, and other electronic-type components -----	(X)	11.5	(NA)	(NA)
344401	Sheet metal products, except stampings -----	(X)	2.8	(NA)	(NA)
345001	Bolts, nuts, screws, washers, rivets, and screw machine products -----	(X)	2.2	(NA)	(NA)
364300	Current-carrying wiring devices -----	(X)	1.2	(NA)	(NA)
282104	Plastics resins consumed in the form of granules, pellets, powders, liquids, etc., excluding sheets, rods, tubes, and shapes ----- mil lb..	(D)	(D)	(NA)	(NA)
349012	Fabricated wire products -----	(X)	.5	(NA)	(NA)
308006	Fabricated plastics products, except gaskets -----	(X)	1.9	(NA)	(NA)
320101	Glass and glass products, excluding windows and mirrors -----	(X)	35.1	(NA)	(NA)
346901	Metal stampings -----	(X)	2.1	(NA)	(NA)
382501	Electrical instrument mechanisms and meter movements, including instrument relays -----	(X)	(D)	(NA)	(NA)
382591	Electrical measuring instruments and parts, n.e.c. -----	(X)	4.6	(NA)	(NA)
360101	Electric transmission, distribution, and control equipment -----	(X)	(D)	(NA)	(NA)
357001	Electronic computing equipment and parts -----	(X)	8.2	(NA)	(NA)
260003	Paper and paperboard products, except paperboard boxes, containers, and corrugated paperboard ----- 1,000 s tons..	(S)	.7	(NA)	(NA)
265001	Paperboard containers, boxes, and corrugated paperboard ----- do..	(S)	8.8	(NA)	(NA)
970099	All other materials and components, parts, containers, and supplies -----	(X)	⁵ 194.5	(NA)	(NA)
971000	Materials, parts, containers, and supplies, n.s.k. ² -----	(X)	188.1	(NA)	(NA)
INDUSTRY 3829, MEASURING AND CONTROLLING DEVICES, N.E.C.					
	Materials, parts, containers, and supplies -----	(X)	³ 1 085.2	(X)	(³)
	Mill shapes and forms, except castings and forgings:				
	Carbon steel ----- 1,000 s tons..	(S)	31.1	(NA)	(NA)
331020	Alloy steel (except stainless) ----- do..	(S)	6.1	(NA)	(NA)
331031	Stainless steel ----- do..	(S)	12.8	(NA)	(NA)
	Copper and copper-base alloy:				
335728	Bare wire (for electrical conduction only) ----- mil lb..	(S)	2.0	(NA)	(NA)
335102	Rod, bar, and mechanical wire, including extruded and/ or drawn shapes ----- do..	*2.8	3.5	(NA)	(NA)
335143	Plate, sheet, and strip, including military cups and discs ----- do..			(NA)	(NA)
335152	Pipe and tube ----- do..			(NA)	(NA)
	Aluminum and aluminum-base alloy:				
335301	Sheet, plate, and foil ----- mil lb..	(S)	8.4	(NA)	(NA)
335405	Extruded shapes, including extruded rod, bar, pipe, tube, etc. ----- do..	(S)	4.1	(NA)	(NA)
335008	All other aluminum mill shapes and forms (wire, rolled rod and bar, powder, welded tubing, etc.) ----- do..	(S)	2.7	(NA)	(NA)

See footnotes at end of table.

Table 7. Materials Consumed by Kind: 1987 and 1982—Con.

[Includes quantity and cost of materials consumed or put into production by establishments classified only in this industry. For further explanation, see Cost of Materials in appendixes. For meaning of abbreviations and symbols, see introductory text]

1987 material code	Material	1987		1982	
		Quantity ¹	Delivered cost (million dollars)	Quantity ¹	Delivered cost (million dollars)
	INDUSTRY 3829, MEASURING AND CONTROLLING DEVICES, N.E.C.—Con.				
	Castings (rough and semifinished):				
332012	Iron (gray and malleable) and steel 1,000 s tons..	(S)	15.6	(NA)	(NA)
336005	Aluminum and aluminum-base alloy mil lb..	(S)	7.9	(NA)	(NA)
336003	Other nonferrous do..	(D)	(⁵)	(NA)	(NA)
367004	Resistors, capacitors, transformers, electron tubes, semiconductors, and other electronic-type components	(X)	90.6	(NA)	(NA)
265001	Paperboard containers, boxes, and corrugated paperboard .. 1,000 s tons..	(S)	3.1	(NA)	(NA)
320101	Glass and glass products, excluding windows and mirrors.....	(X)	8.5	(NA)	(NA)
	Bearings, including mounted and unmounted:				
356218	Ball	(X)	3.3	(NA)	(NA)
356201	Roller.....	(X)	2.3	(NA)	(NA)
364300	Current-carrying wiring devices	(X)	16.4	(NA)	(NA)
382501	Electrical instrument mechanisms and meter movements, including instrument relays	(X)	20.0	(NA)	(NA)
282104	Plastics resins consumed in the form of granules, pellets, powders, liquids, etc., excluding sheets, rods, tubes, and shapes mil lb..	(S)	6.3	(NA)	(NA)
344401	Sheet metal products, except stampings	(X)	20.6	(NA)	(NA)
345001	Bolts, nuts, screws, washers, rivets, and screw machine products	(X)	15.0	(NA)	(NA)
346901	Metal stampings	(X)	4.6	(NA)	(NA)
308006	Fabricated plastics products, except gaskets, hose, and belting	(X)	7.1	(NA)	(NA)
357004	Electronic computing equipment and parts.....	(X)	36.1	(NA)	(NA)
970099	All other materials and components, parts, containers, and supplies.....	(X)	⁵ 365.0	(NA)	(NA)
971000	Materials, parts, containers, and supplies, n.s.k. ²	(X)	388.4	(NA)	(NA)

¹For some establishments, data have been estimated from central unit values which are based on quantity-cost relationships of reported data. The following symbols are used when percentage of each quantity figure estimated in this manner equals or exceeds 10 percent of published figure: * 10 to 19 percent estimated; ** 20 to 29 percent estimated. If 30 percent or more is estimated, figure is replaced by (S).

²Total cost of materials of establishments that did not report detailed materials data, including establishments that were not mailed a form.

³Industry definition is new for 1987; therefore, 1987 data for materials consumed are not comparable to prior-year data. As a result, 1982 materials consumed data are not available.

⁴For 1987, data for material codes 331013 and 331017 have been combined with material code 331019 to avoid disclosing data for individual companies.

⁵Data have been combined with material code 970099 to avoid disclosing data for individual companies.

⁶For 1982, data for material codes 332011 and 332045 were combined with material code 336008 to avoid disclosing data for individual companies.

⁷For 1982, data for material codes 362110 and 362115 were combined to avoid disclosing data for individual companies.

⁸For 1987, data for material codes 331015, 331017, and 331019 have been combined to avoid disclosing data for individual companies.

⁹For 1987, data for material codes 331013 and 331019 have been combined to avoid disclosing data for individual companies.

APPENDIX A.

Explanation of Terms

This appendix is in two sections. Section 1 includes items requested of all establishments mailed census of manufactures forms including annual survey of manufactures (ASM) forms. Note that this section also includes several items (number of establishments and companies, value added, classes of products, and specialization and coverage ratios) not included on the report forms but derived from information collected on the forms. Section 2 covers supplementary items requested only from establishments included in the ASM sample. Results of the supplementary ASM inquiries are included in table 3c of this report.

SECTION 1. ITEMS COLLECTED OR DERIVED BASED ON ALL CENSUS OF MANUFACTURES (INCLUDING ASM) REPORT FORMS

Number of establishments and companies—As discussed in the Introduction, a separate report was required for each manufacturing establishment (plant) with one employee or more. An establishment is defined as a single physical location where manufacturing is performed. A company, on the other hand, is defined as a business organization consisting of one establishment or more under common ownership or control.

If the company operated at different physical locations, even if the individual locations were producing the same line of goods, a separate report was requested for each location. If the company operated in two or more distinct lines of manufacturing at the same location, a separate report was requested for each activity.

An establishment not in operation for any portion of the year was requested to return the report form with the proper notation in the "Operational Status" section of the form. In addition, the establishment was requested to report data on any employees, capital expenditures, inventories, or shipments from inventories during the year.

In this report, data are shown for establishments in operation at any time during the year. A comparison with the number of establishments in operation at the end of the year will be provided in the Introduction of the General Summary subject report.

Employment and related items—The report forms requested separate information on production workers for a specific payroll period within each quarter of the year and on other employees as of the payroll period which included the 12th of March.

All employees—This item includes all full-time and part-time employees on the payrolls of operating manufacturing establishments during any part of the pay period which included the 12th of the months specified on the report form. Included are all persons on paid sick leave, paid holidays, and paid vacations during these pay periods.

Officers of corporations are included as employees; proprietors and partners of unincorporated firms are excluded. The "all employees" number is the average number of production workers plus the number of other employees in mid-March. The number of production workers is the average for the payroll periods including the 12th of March, May, August, and November.

Production workers—This item includes workers (up through the line-supervisor level) engaged in fabricating, processing, assembling, inspecting, receiving, storing, handling, packing, warehousing, shipping (but not delivering), maintenance, repair, janitorial and guard services, product development, auxiliary production for plant's own use (e.g., power plant), recordkeeping, and other services closely associated with these production operations at the establishment covered by the report. Employees above the working-supervisor level are excluded from this item.

All other employees—This item covers nonproduction employees of the manufacturing establishment including those engaged in factory supervision above the line-supervisor level. It includes sales (including driver salespersons), sales delivery (highway truck drivers and their helpers), advertising, credit, collection, installation and servicing of own products, clerical and routine office function, executive, purchasing, financing, legal, personnel (including cafeteria, medical, etc.), professional, and technical employees. Also included are employees on the payroll of the manufacturing establishment engaged in the construction of major additions or alterations to the plant and utilized as a separate work force.

In addition to reports sent to operating manufacturing establishments, information on employment during the payroll period which included March 12 and annual payrolls also was requested of auxiliary units (e.g., administrative offices, warehouses, and research and development laboratories) of multiestablishment companies. However, these figures are not included in the totals for individual

industries shown in this report. They are included in the general summary and geographic area reports as a separate category.

Payroll—This item includes the gross earnings of all employees on the payroll of operating manufacturing establishments paid in the calendar year 1987. Respondents were told they could follow the definition of payrolls used for calculating the Federal withholding tax. It includes all forms of compensation, such as salaries, wages, commissions, dismissal pay, bonuses, vacation and sick leave pay, and compensation in kind, prior to such deductions as employees' Social Security contributions, withholding taxes, group insurance, union dues, and savings bonds. The total includes salaries of officers of corporations; it excludes payments to proprietors or partners of unincorporated concerns. Also excluded are payments to members of Armed Forces and pensioners carried on the active payroll of manufacturing establishments.

The census definition of payrolls is identical to that recommended to all Federal statistical agencies by the Office of Management and Budget. It should be noted that this definition does not include employers' Social Security contributions or other nonpayroll labor costs, such as employees' pension plans, group insurance premiums, and workers' compensation.

The ASM provides estimates of employers' supplemental labor costs, both those required by Federal and State laws and those incurred voluntarily or as part of collective bargaining agreements. (Supplemental labor costs are explained later in this appendix.)

As in the case of employment figures, the payrolls of separate auxiliary units of multiestablishment companies are not included in the totals for individual industries or industry groups.

Production-worker hours—This item covers hours worked or paid for at the plant, including actual overtime hours (not straight-time equivalent hours). It excludes hours paid for vacations, holidays, or sick leave.

Cost of materials—This term refers to direct charges actually paid or payable for items consumed or put into production during the year, including freight charges and other direct charges incurred by the establishment in acquiring these materials. It includes the cost of materials or fuel consumed, whether purchased by the individual establishment from other companies, transferred to it from other establishments of the same company, or withdrawn from inventory during the year.

The important components of this cost item are (1) all raw materials, semifinished goods, parts, containers, scrap, and supplies put into production or used as operating supplies and for repair and maintenance during the year, (2) electric energy purchased, (3) fuels consumed for heat, power, or the generation of electricity, (4) work done by

others on materials or parts furnished by manufacturing establishments (contract work), and (5) products bought and resold in the same condition. (See discussion of duplication of data below.)

Specific materials consumed—In addition to the total cost of materials, which every establishment was required to report, information also was collected for most manufacturing industries on the consumption of major materials used in manufacturing. The inquiries were restricted to those materials which were important parts of the cost of production in a particular industry and for which cost information was available from manufacturers' records. Information on the establishments consuming less than a specified amount (usually \$10,000) of a specific material were not requested to report consumption of that material separately. Also, the cost of materials for the small establishments for which either administrative records or short forms were used was imputed as "not specified by kind." (See the introduction for the importance of administrative records in the industry.)

Value of shipments—This item covers the received or receivable net selling values, f.o.b. plant (exclusive of freight and taxes), of all products shipped, both primary and secondary, as well as all miscellaneous receipts, such as receipts for contract work performed for others, installation and repair, sales of scrap, and sales of products bought and resold without further processing. Included are all items made by or for the establishments from materials owned by it, whether sold, transferred to other plants of the same company, or shipped on consignment. The net selling value of products made in one plant on a contract basis from materials owned by another was reported by the plant providing the materials.

In the case of multiunit companies, the manufacturer was requested to report the value of products transferred to other establishments of the same company at full economic or commercial value, including not only the direct cost of production but also a reasonable proportion of "all other costs" (including company overhead) and profit. (See discussion of duplication of data below.)

Individual products—As in previous censuses, data were collected for most industries on the quantity and value of individual products shipped. In the 1987 census program, information was collected on the output of approximately 11,000 individual product items. The term "product", as used in the census of manufactures, represents the finest level of detail for which output information was requested. Consequently, it is not necessarily synonymous with the term "product" as used in the marketing sense. In some cases, it may be much more detailed and, in other cases, it is more aggregative. For example, "pharmaceutical preparations" was distributed into over 100 terms; whereas, "motor gasoline" was reported as a single item.

Approximately 6,600 of the product items were listed separately on the 1987 census report forms. Data for

about 4,400 products were obtained in the monthly, quarterly, or annual surveys comprising the Current Industrial Reports series of the Census Bureau. Totals for the year 1987 for these items, as derived from the commodity surveys, are shown in the "products shipped" table (table 6a-2).

The list of products for which separate information was collected was prepared after consultation with industry and government representatives. Comparability with previous figures was given considerable weight in the selection of product categories so that comparable 1982 information is presented for most products.

Typically, both quantity and value of shipments information were collected. However, if quantity was not significant or could not be reported by manufacturers, only value of shipments was collected.

Shipments include both commercial shipments and transfers of products to other plants of the same company. For industries in which a considerable portion of the total shipments is transferred to other plants of the same company, separate information on interplant transfers also was collected. Moreover, for products that are used to a large degree within the same establishment as materials or components in the fabrication of other products, total production and often consumption of the item within the plant was collected. Typically, the information on production also was collected for products for which there are significant differences between total production and shipments in a given year because of wide fluctuations in finished goods inventories. Other measures of output of products with long production cycles were used as appropriate and feasible.

Classes of products—To summarize the product information, the separate products were aggregated into classes of products that, in turn, were grouped into all primary products of each industry. The code structure used is a seven-digit number for the individual product, a five-digit number for the class of product, and a four-digit number for the total primary products in an industry. (See Introduction, Industry Classification of Establishments, for application of the coding structure to the assignment of SIC codes for establishments.)

In the 1987 census, the 11,000 products were grouped into approximately 1,500 separate classes on the basis of general similarity of manufacturing processes, types of materials used, and the like. However, the grouping of products was affected by the economic significance of the class and, in some cases, dissimilar products were grouped because the products were not sufficiently significant to warrant separate classes.

Duplication in cost of materials and value of shipments—The aggregate of the cost of materials and value of shipments figures for industry groups and for all manufacturing industries includes large amounts of duplication since the products of some industries are used as materials by others. This duplication results, in part, from the

addition of related industries representing successive stages in the production of a finished manufactured product. Examples are the addition of flour mills to bakeries in the food group and the addition of pulp mills to paper mills in the paper and allied products group of industries. Estimates of the overall extent of this duplication indicate that the value of manufactured products exclusive of such duplication (the value of finished manufactures) tends to approximate two-thirds of the total value of products reported in the annual survey.

Duplication of products within individual industries is significant within a number of industry groups, e.g., machinery and transportation industries. These industries frequently include complete machinery and their parts. In this case, the parts made for original equipment are materials consumed for assembly plants in the same industry.

Even when no significant amount of duplication is involved, value of shipments figures are deficient as measures of the relative economic importance of individual manufacturing industries or geographic areas because of the wide variation in ratio of materials, labor, and other processing costs of value of shipments, both among industries and within the same industry.

Before 1962, cost of materials and value of shipments were not published for some industries which included considerable duplication. Since then, these data have been published for all industries at the United States level and beginning in 1964, for all geographic levels.

Value added by manufacture—This measure of manufacturing activity is derived by subtracting the cost of materials, supplies, containers, fuel, purchased electricity, and contract work from the value of shipments (products manufactured plus receipts for services rendered). The result of this calculation is adjusted by the addition of value added by merchandising operations (i.e., the difference between the sales value and the cost of merchandise sold without further manufacture, processing, or assembly) plus the net change in finished goods and work-in-process between the beginning- and end-of-year inventories.

For those industries where value of production is collected instead of value of shipments (see footnote in table 1a), value added is adjusted only for the change in work-in-process inventories between the beginning and end of year. For those industries where value of work done is collected, the value added does not include an adjustment for the change in finished goods or work-in-process inventories.

"Value added" avoids the duplication in the figure for value of shipments that results from the use of products of some establishments as materials by others. Value added is considered to be the best value measure available for comparing the relative economic importance of manufacturing among industries and geographic areas.

New and used capital expenditures—For establishments in operation and any known plants under construction, manufacturers were asked to report their new expenditures for (1) permanent additions and major alterations to

manufacturing establishments, and (2) machinery and equipment used for replacement and additions to plant capacity if they were of the type for which depreciation accounts were ordinarily maintained.

The totals for new expenditures include expenditures leased from nonmanufacturing concerns through capital leases, new facilities owned by the Federal Government but operated under contract by private companies, and plant and equipment furnished to the manufacturer by communities and nonprofit organizations. Also excluded are expenditures for used plant and equipment (although reported in the census), expenditures for land, and cost of maintenance and repairs charged as current operating expenses.

Manufacturers also were requested to report the value of all used buildings and equipment purchased during the year at the purchase price. For any equipment or structure transferred for the use of the reporting establishment by the parent company or one of its subsidiaries, the value at which it was transferred to the establishment was to be reported. Furthermore, if the establishment changed ownership during the year, the cost of the fixed assets (building and equipment) was to be reported under used capital expenditures.

Total expenditures for used plant and equipment is a universe figure; it is collected on all census forms. However, the breakdown of this figure between expenditures for used buildings and other structures and expenditures for used machinery and equipment is collected only on the ASM form. The data for total new capital expenditures, new building expenditures, and new machinery expenditures, as well as the data for total used expenditures, are shown in table 3b.

End-of-year inventories—Respondents were asked to report their 1986 and 1987 end-of-year inventories at cost or market. Effective with the 1982 Economic Censuses, this change to a uniform instruction for reporting inventories was introduced for all sector reports. Prior to 1982, respondents were permitted to value inventories using any generally accepted accounting method (FIFO, LIFO, market, to name a few). In 1982, LIFO users were asked to first report inventory values prior to the LIFO adjustment and then to report the LIFO reserve and the LIFO value after adjustment for the reserve.

SECTION 2. ITEMS COLLECTED ONLY ON ASM REPORT FORMS

The following items were collected only from establishments included in the ASM sample:

1. **Supplemental labor costs**—Supplemental labor costs are divided into legally required expenditures and payments for voluntary programs. The legally required portion consists primarily of Federal old age and survivors' insurance, unemployment compensation, and workers' compensation. Payments for voluntary programs include all programs not

Because of this change in reporting instructions, the 1982 through 1987 data for inventories and value added by manufacture included in the tables of this report are not comparable to the prior-year data shown in table 1a of this report and in historical census of manufactures and annual survey of manufactures publications.

In using inventory data by stage of fabrication for "all industries" and at the two-digit industry level, it should be noted that an item treated as a finished product by an establishment in one industry may be reported as a raw material by another establishment in a different industry. For example, the finished-product inventories of a steel mill would be reported as raw materials by a stamping plant. Such differences are present in the inventory figures by stage of fabrication shown for individual industries, industry groups, and "all manufacturing", which are aggregates of figures reported by establishments in specified industries.

Specialization and coverage ratios—These items are not collected on the report forms but are derived from the data shown in table 5b. An establishment is classified in a particular industry if its shipments of primary products of that industry exceed in value its shipments of the products of any other single industry.

As noted in the introduction, an establishment's shipments include those products assigned to an industry (primary products), those considered primary to other industries (secondary products), and receipts for miscellaneous activities (merchandising, contract work, resales, etc.). Specialization and coverage ratios have been developed to measure the relationship of primary product shipments to the data on shipments for the industry shown in tables 1a through 5a and data on product shipments shown in tables 6a through 6c.

Specialization ratio represents the ratio of primary product shipments to total product shipments (primary and secondary, excluding miscellaneous receipts) for the establishments classified in the industry.

Coverage ratio represents the ratio of primary products shipped by the establishments classified in the industry to the total shipments of such products that are shipped by all manufacturing establishments wherever classified.

specifically required by legislation whether they were employer initiated or the result of collective bargaining. They include the employer portion of such plans as insurance premiums, premiums for supplemental accident and sickness insurance, pension plans, supplemental unemployment compensation, welfare plans, stock purchase plans on which the employer payment is not subject to withholding tax, and deferred profit-sharing plans.

They exclude such items as company-operated cafeterias, in-plant medical services, free parking lots, discounts on employee purchases, and uniforms and work clothing for employees. While the excluded items do benefit employees and all or part of their cost generally is similar to the items covered in the ASM labor costs statistics, accounting records generally do not provide reliable figures on net employee benefits of these types.

2. **Retirements of depreciable assets**—Included in this item is the gross value of assets sold, retired, scrapped, destroyed, etc., during 1987. When a complete operation or establishment changed ownership, the respondent was instructed to report the value of the assets sold at the original cost as recorded in the books of the seller. The respondent also was requested to report retirements of equipment or structures owned by a parent company that the establishment was using as if it were a tenant.
3. **Depreciation charges for fixed assets**—This item includes depreciation and amortization charged during the year against assets. Depreciation charged against fixed assets acquired since the beginning of the year and against assets sold or retired during the year are components of this category. Respondents were requested to make certain that they did not report accumulated depreciation.
4. **Rental payments**—Total rental payments is collected on all census forms. However, the breakdown between rental payments for buildings and other structures and rental payments for machinery and equipment is collected only on the ASM forms. This item includes rental payments for the use of all items for which depreciation reserves would be maintained if they were owned by the establishment, e.g., structures and buildings, and production, office, and transportation equipment. Excluded are royalties and other payments for the use of intangibles and depletable assets, and land rents where separable.

When an establishment of a multiestablishment company was charged rent by another part of the same company for the use of assets owned by the company, it was instructed to exclude that cost from rental payments. However, the book value (original cost) of these company-owned assets was to be reported as assets of the establishment at the end of the year.

If there were assets at an establishment rented from another company and the rents were paid centrally by the head office of the establishment, the company was instructed to report these rental payments as if they were paid directly by the establishment.

5. **Depreciable assets**—Total value of gross depreciable assets is collected on all census forms.

However, the detail for depreciable assets is collected only on the ASM forms. The data encompass all fixed depreciable assets on the books of establishments at the beginning and end of the year. The values shown (book value) represent the actual cost of assets at the time they were acquired, including all costs incurred in making the assets usable (such as transportation and installation). Included are all buildings, structures, machinery, and equipment (production, office, and transportation equipment) for which depreciation reserves are maintained. Excluded are nondepreciable capital assets, including inventories and intangible assets, such as timber and mineral rights.

The definition of fixed depreciable assets is consistent with the definition of capital expenditures. For example, expenditures include actual capital outlays during the year, rather than the final value of equipment put in place and buildings completed during the year. Accordingly, the value of assets at the end of the year includes the value of construction in progress. In addition, respondents were requested to make certain that assets at the beginning of the year plus new and used capital expenditures, less retirements, equalled assets at the end of the year.

6. **New and used capital expenditures**—The data for total new capital expenditures, new building expenditures, new machinery expenditures, and total used capital expenditures are collected on all census forms. However, the breakdown between expenditures for used buildings and other structures and expenditures for used machinery and equipment is collected only on the ASM form. (See further explanation on capital expenditures in section 1.)
7. **Quantity of electric energy consumed for heat and power**—Data on the cost of purchased electric energy were collected on all census forms. However, data on the quantity of purchased electric energy were collected only on the ASM forms. In addition, information was collected on the quantity of electric energy generated by the establishment and the quantity of electric energy sold or transferred to other plants of the same company.
8. **Breakdown of new capital expenditures for machinery and equipment**—ASM establishments were requested to separate their capital expenditures for new machinery and equipment into (1) automobiles, trucks, etc., for highway use, (2) computers and peripheral data processing equipment, and (3) all other.

The category "automobiles, trucks, etc., for highway use" is intended to measure expenditures for vehicles designed for highway use that were acquired through a purchase or lease-purchase agreement.

Vehicles normally operating off public highways (vehicles specifically designed to transport materials, property, or equipment on mining, construction, logging, and petroleum development projects) are excluded from this item.

9. **Foreign content of cost of materials**—Establishments included in the ASM sample panel were requested to provide information on foreign-made materials purchased or transferred from foreign sources. This includes materials acquired from a central warehouse or other domestic establishment of the same company but made in an operation outside of the 50 States, District of Columbia, Puerto Rico, or U.S. territories.
10. **Cost of purchased services**—ASM establishments were requested to provide information on the cost of purchased services for the repair of buildings and other structures, the repair of machinery, and communication services. Included in the cost of purchased services for the repair of buildings and machinery are payments made for all maintenance and repair work on buildings and equipment, such as painting, roof repairs, replacing parts, and overhauling equipment. Such payments made to other establishments of the same company and for repair and maintenance of any leased property also are included. Extensive repairs or reconstruction that were capitalized are considered capital expenditures for used buildings and machinery and are, therefore, excluded from this item. Repair and maintenance costs provided by an owner as part of a rental contract or incurred directly by an establishment in using its own work force also are excluded.

Three basic approaches were utilized to produce these statistics.

1. For items 1 through 6, data were estimated (imputed) for all non-ASM establishments using the available data in the establishment record and industry-based parameters. The statistics were then generated by simply tabulating all census records including the imputed value for non-ASM establishments and the unweighted value for ASM establishments. Separate imputation rates were developed and are shown in the table. For quantity of purchased electricity for heat and power (item 7), a similar procedure was used; however, the imputation parameters were geographically-based instead of industry-based. For quantities of generated less sold electricity, no imputation was performed for non-ASM establishments. The estimates for these items are simply tabulations of unweighted ASM values.

Since the published statistics for these items were developed from the complete census universe and not just the ASM establishments, there are no sampling variances associated with these statistics. However, there is an unknown level of bias for each of the items due to the imputation of the non-ASM establishments. This bias is felt to be small due to the strong correlation between the items being imputed and the collected items that were used to generate the impute values.

2. For items 8 and 9, the estimates were developed using a ratio estimation methodology. For item 8, an estimate of the breakout of new capital expenditures for machinery and equipment into the three categories was made from ASM establishments reporting these categories. The estimated proportions were then applied to the corresponding Census value for new capital expenditures for machinery and equipment to produce the estimates.

The estimates for item 9, foreign content of cost of materials, were developed in a similar manner based on costs of parts, supplies, and components (item 5a) as the control total for the three categories.

For items 8 and 9, an adjustment ratio of the following form was computed.

$$R_j = \frac{NM_c}{TME_{asm}}$$

where:

NM_c = the census value of new capital expenditures for machinery and equipment

TME_{asm} = the weighted ASM value of new capital expenditures for machinery and equipment from reporters of the detailed breakout data

3. For item 10, cost of purchased services, the estimates were made by simply tabulating weighted data for all the ASM records that reported the item. A response coverage ratio (a measure of the extent to which respondents reported for each item) is shown in table 3c for the three types of services. It is derived for each item by calculating the ratio of the weighted employment (establishment data multiplied by sample weight, see appendix B) for those ASM establishments that reported the specific inquiry to the weighted total employment for all ASM establishments classified in the industry.

APPENDIX B.

Annual Survey of Manufactures (ASM) Sampling and Estimating Methodologies

DESCRIPTION OF SURVEY SAMPLE

The Annual Survey of Manufactures (ASM) contains two components. The mail portion of the survey is a probability sample of about 56,000 manufacturing establishments selected from a total of about 220,000 establishments. These 220,000 establishments represent all manufacturing establishments of multiunit companies and all single establishment companies mailed schedules in the 1982 Census of Manufactures. This mail portion is supplemented annually by a Social Security Administration list of new manufacturing establishments opened after 1982 and a list of new multiunit manufacturing establishments identified from the Census Bureau's Company Organization Survey.

The 1984 through 1988 ASM sample differs slightly from the previous sample. For the current panel, all establishments of companies with 1982 shipments in manufacturing in excess of \$500 million were included in the survey panel with certainty. There are approximately 500 such companies collectively accounting for approximately 18,000 establishments. For the remaining portion of the mail survey, the establishment was defined as the sampling unit. For this portion, all establishments with 250 employees or more and establishments with a very large value of shipments also were included in the survey panel with certainty. A total of 12,100 establishments were selected from this portion of the universe with certainty. Therefore, of the 56,000 manufacturing establishments included in the ASM panel, approximately 31,000 are selected with certainty. These certainty establishments collectively account for approximately 80 percent of the total value of shipments in the 1982 census.

Smaller establishments in the remaining portion of the mail survey were sampled with probabilities ranging from 0.999 to 0.005 in accordance with mathematical theory for optimum allocation of a sample. The probabilities of selection assigned to the smaller establishments were proportional to measures of size determined for each establishment. The measures of size depend directly upon each establishment's 1982 product class values and the historic variability of the year-to-year shipments of each product class. Product classes displaying more volatile year-to-year change in shipments at the establishment level were sampled at a heavier rate.

This method of assigning measures of size was used in order to maximize the precision (that is, minimize the variance of estimates of the year-to-year change) in the value of product class shipments. Implicitly, it also gave weight differences in employment, value added, and other

general statistics, since these are highly correlated with value of shipments. Individual sample selection probabilities were obtained by multiplying each establishment's final measure of size by an overall sampling fraction coefficient calculated to yield a total expected sample size.

The sample selection procedure gave each establishment in the sampling frame an independent chance of selection. This method of independent selection permits the rotation of small establishments out of a given sample panel without introducing a bias into the survey estimates.

The nonmail portion of the survey includes all single-establishment companies that were tabulated as administrative records in the 1982 Census of Manufactures. Although this portion contained approximately 130,000 establishments, it accounted for less than 2 percent of the estimate for total value of shipments at the total manufacturing level. This portion was not sampled; rather, the data for every establishment in this group were estimated based on selected information obtained annually from the administrative records of the Internal Revenue Service and the Social Security Administration. This administrative-record information, which includes payroll, total employment, industry classification, and physical location of the establishment, was obtained under conditions which safeguard the confidentiality of both tax and census records. Estimates of data other than payroll and employment for these small establishments were developed from industry averages.

The corresponding estimates for the mail and nonmail establishments were added together, along with the base-year differences, as defined in the Description of Estimating Procedure section, to produce the figures shown in this publication.

DESCRIPTION OF ESTIMATING PROCEDURES

Most of the ASM estimates for the years 1983-1986 were computed using a difference estimation procedure. For each item, a base-year difference was developed. This base-year difference is equal to the difference between the 1982 census published number for an item total and the linear ASM estimate of the total for 1982. The ASM linear estimate was obtained by multiplying each sample establishment's data by its sample weight (the reciprocal of its probability of selection) and summing the weighted values.

These base-year differences were then added to the corresponding current-year linear estimates, which include the sum of the estimates for the mail and nonmail establishments, to produce the estimates for the years 1983-1986. Estimates developed by this procedure usually are far more reliable than comparable linear estimates developed from the current sample data alone.

The 1987 sample estimates for the purchased service items, shown in table 3c, are strictly ASM linear estimates, however, developed only from ASM establishments that reported the specific item.

The remaining estimates in table 3c, showing the breakdown of expenditures for new machinery and equipment and costs of parts (separated into purchases from foreign sources and purchases from domestic sources), were computed as ratio estimates. To do this, linear estimates of the new machinery detail items were developed from the ASM establishments and were ratio adjusted to the corresponding census total for new machinery. In a similar fashion, the ASM linear estimates of the detailed purchased materials items were ratio adjusted to the corresponding census total for cost of parts.

QUALIFICATIONS OF THE DATA

The estimates developed from the sample are apt to differ somewhat from the results of a survey covering all companies in the sampled lists but otherwise conducted under essentially the same conditions as the actual sample survey. The estimates of the magnitude of the sampling errors (the differences between the estimates obtained and the results theoretically obtained from a comparable, complete-coverage survey) are provided by the standard errors of the estimates.

The particular sample selected for the ASM is one of a large number of similar probability samples that, by chance, might have been selected under the same specifications. Each of the possible samples would yield somewhat different sets of results, and the standard errors are measures of the variation of all the possible sample estimates around the theoretical, comparable, complete-coverage values.

Estimates of the standard errors have been computed from the sample data for selected statistics in this report. They are presented in the form of relative standard errors (the standard errors divided by the estimated values to which they refer).

In conjunction with its associated estimate, the relative standard error may be used to define confidence intervals (ranges that would include the comparable, complete-coverage value for specified percentages of all the possible samples).

The complete coverage value would be included in the range:

1. From one standard error below to one standard error above the derived estimate for about two-thirds of all possible samples.
2. From two standard errors below to two standard errors above the derived estimate for about 19 of 20 of all possible samples.
3. From three standard errors below to three standard errors above the derived estimate for nearly all samples.

An inference that the comparable, complete-survey result would be within the indicated ranges would be correct in approximately the relative frequencies shown. Those proportions, therefore, may be interpreted as defining the confidence that the estimates from a particular sample would differ from complete-coverage results by as much as one, two, or three standard errors, respectively.

For example, suppose an estimated total is shown as 50,000 with an associated relative standard error of 2 percent, that is, a standard error of 1,000 (2 percent of 50,000). There is approximately 67 percent confidence that the interval 49,000 to 51,000 includes the complete-coverage total, about 95 percent confidence that the interval 48,000 to 52,000 includes the complete-coverage total and almost certain confidence that the interval 47,000 to 53,000 includes the complete coverage total.

In addition to the sample errors, the estimates are subject to various response and operational errors: errors of collection, reporting, coding, transcription, imputation for nonresponse, etc. These operational errors also would occur if a complete canvass were to be conducted under the same conditions as the survey. Explicit measures of their effects generally are not available. However, it is believed that most of the important operational errors were detected and corrected in the course of the Bureau's review of the data for reasonableness and consistency. The small operational errors usually remain. To some extent, they are compensating in the aggregated totals shown. When important operational errors were detected too late to correct the estimates, the data were suppressed or were specifically qualified in the tables.

As derived, the estimated standard errors included part of the effect of the operational errors. The total errors, which depend upon the joint effect of the sampling and operational errors, are usually of the order of size indicated by the standard error, or only moderately higher. However, for particular estimates, the total error may considerably exceed the standard errors shown.

The concept of complete coverage under the conditions prevailing for the ASM is not identical to the complete coverage of the census of manufactures, as the censuses have been conducted. Nearly all types of operational errors that affect the ASM also occur in the censuses. The ASM and the censuses, are conducted under quite different conditions, and operational errors can be better controlled in the ASM than in the censuses. As a result, for many of the census figures, the errors are of the same order of size as the total errors of the corresponding annual survey estimates. The differences between the census and ASM operating conditions also disturb, to some degree, the comparability of the ASM and census data.

Any figures shown in the tables in this publication having an associated standard error exceeding 15 percent may be of limited reliability. However, the figure may be combined with higher-level totals, creating a broader aggregate, which then may be of acceptable reliability.

APPENDIX C.

Changes in Census of Manufactures

Product Classes for 1987

[Based on revisions to the Standard Industrial Classification (SIC) Manual, definitions of some product classes were revised for 1987. Listed below are the revisions to the product classes]

1987	1982	1987	1982	1987	1982	1987	1982
30521	30411	30899 3089A	3079K pt	34919	34948	35483	36233
30522	30412	32295	32291 pt	34921	3494B	35484	35496
30523	30413	32296	32292 pt	34922	3494C	35485	35495 pt 35497
30524	30414	32297	32294 pt	34923	3494D	35533	35531 pt
30525	30415	32298	32291 pt 32292 pt 32294 pt	34924	3494E	35534	35532 pt
30526	30416	32311	32317	34925	3494F	35543	35541 35542 pt
30534	32934	32312	32317	34926	3494G	35544	35542 pt
30535	32935	32927	32928 32929	34927	3494H	35558	35557 pt
30536	32936	32961	32963 32965	3523C	35234 pt 35237 35238 pt	35561	35511
30537	32937	32962	32964 32966	3523E	35234 pt 35238 pt	35562	35512
30538	32938	33152	33152 34967	3523F	3523A 3523B	35563	35513 pt
30539	32939	33391	33331	35246	35243 35245	35591	35591 35699 pt
30611	3069A pt	33392	33334	3531A	35311	35596	35595 pt
30612	3069A pt	33398	33321 33323 33399	3531B	35312	35597	35494
30613	3069A pt	33561 33562 33563	33569	3531C	35317	35599	35595 pt 36360 36362
30614	3069B pt	33630	33611	3531E	35314 pt	35616	3561C
30615	3069B pt	33640	33620 pt 33691 pt 33692 pt 33693 pt	3531F	35316	35631	35631 pt
30616	3069B pt	33650	33612	3531G	35318 pt	35651	35513 pt 35514 pt 35691 pt
30617	3069B pt	33660	33620 pt	3531H	35313 pt 35318 pt 35319 pt	35652	35513 pt 35514 pt 35691 pt
3069C	3069C 35557 pt	33690	33691 pt 33692 pt 33693 pt	3531K	35319 pt 35361 pt 35371 pt	35676	35672
3069E	30310	34234	34232 pt	3531M	35313 pt 35314 pt 35319 pt 35372 pt	35692	35694 35695 35696
30810	30792	34235	34232 pt 35531 pt 35532 pt	35337	35331 35332 pt	35697 35698	35699 pt
30820	3079K pt	34236	34233	35338	35332 pt	35711	35731 36629 pt
30830	3079K pt	34441 34443 34447 34448 34449	34446	35339	35333	35712	35734 pt 35735 pt
30840	30794	34461 34462 34463 34464 34465	34460	3533A	35335	35721	35732 pt
30850	30795	34696 34699	34699	3533B	35336	35722	35734 pt 35735 pt
30861 30862 30863 30864 30865 30866	30797	34911 34912 34913 34914 34915 34916	3494A	35363	35361 pt	35751	35732 pt 36612 pt
30870	3079K pt	34917	34949	35364	35362 pt	35752	35734 pt 35735 pt
30880	3079J pt 3079K pt	34918	34947	35374	35362 pt 35372 pt	35771	35732 pt
30891	3079J pt 3079K pt	34919	34948	3541D	35411 35412	35772	35734 pt 35735 pt
30892	3079J pt 3079K pt	34911 34912 34913 34914 34915 34916	3494A	35430	35650	35781	35743
30893	3079J pt 3079K pt	34917	34949	35454	35453	35782	35744
30894	3079J pt 3079K pt	34918	34947	35455	35452	35783	35745
30895	3079J pt 3079K pt	34917	34949	35481	36231	3585C	3585A 36993
30896	2499A pt 3079J pt 3079K pt	34918	34947	35482	36232	3585D	3585B 36994 pt
30897	3079J pt 3079K pt						
30898	3079J pt 3079K pt						

[Based on revisions to the Standard Industrial Classification (SIC) Manual, definitions of some product classes were revised for 1987. Listed below are the revisions to the product classes]

1987	1982	1987	1982	1987	1982	1987	1982
35931	35996 35997	36411	36410	36991—Con. 36995	36629 pt—Con.	38731—Con.	38734—Con. 38736 38737
35932	35998	36412	36994 pt	36997	35497 pt 36629 pt	39113 39114	39112
35933	35999	36520	36521 pt	36998	36994 pt	39153 39154	39151
35941	35617 35618 35631 pt	36613	35732 pt 36612 pt	3714A	37143	39447	36629 pt 39447
35942	3561A 3561B 35631 pt	36614	36612 pt	37999	37994 37998	39493	39494 pt
35961 35962 35963	35760	36631	36621 36629 pt	38121	38111	39495	3079k pt
36123 36126	36125	36632	36622	38122	36625 pt 36629	39496	39494 pt
36251	36138 pt 36794	36691	36624	38210	38112 38113 pt	39523	39521 39522 pt
36252	36221	36692	36626	38260	38320 38326	39524	39522 pt
36253	36222	36693	36628	38271	38324	39651	39630
36254	36138 pt 36223	36714	36711 36712	38272 38273	38325	39654	39641
36330	36331 36333	36715	36799 pt	38295	36625 pt 38293	39656	39642
36395	36361 36394 36399	36720	36797	38296	38113 pt	39998	39620
		36799	36629 pt 36799 pt	38440	36931	39999	39995
		36950	35732 pt 36792	38450	36930 36933	97372	36522
		36991 36992	36629 pt	38731	38734	97819	36521 pt

APPENDIX D.

Changes in Census of Manufactures

Product Codes for 1987

[Based on revisions to the Standard Industrial Classification (SIC) Manual, definitions of some product codes were revised for 1987. Listed below are the revisions to the product codes. The terms published and collected are defined as follows: (1) published refers to the code used in the published reports for 1987 and 1982, and (2) collected refers to the code appearing on the report forms for 1987]

1987 published	1987 collected	1982 published	1987 published	1987 collected	1982 published	1987 published	1987 collected	1982 published	1987 published	1987 collected	1982 published
30118 00	30118 00	30118 19 30118 20	30539 77	32939 77	32939 77	30830 11 30830 13 30830 19	30793 01 30793 03 30793 09	3079K 90	30892 20— Con.	3079D 33— Con.	3079J 61 pt —Con. 3079J 66 pt 3079K 93 pt
3011A 39	3011A 39	3011A 33 3011A 35	30539 79	32939 79	32939 79						
			30539 81	32939 81	32939 81	30840 11	30794 21	30794 21			
3011C 29	3011C 29	3011C 24 3011C 26 3011C 27	30611 00	3069A 00	3069A 11	30840 12	30794 22	30794 22	30892 30	3079D 35	3079J 61 pt 3079J 62 pt 3079J 63 pt 3079J 64 pt 3079J 65 pt 3079J 66 pt 3079K 93 pt
			30612 00	3069A 00	3069A 12 3069A 15	30840 13	30794 23	30794 23			
30521 00	30411 00	30411 00				30840 14	30794 24	30794 24			
30522 00	30412 00	30412 00	30613 00	3069A 00	3069A 13 3069A 14 3069A 16	30840 15	30794 25	30794 25	30892 90	3079D 39	3079J 61 pt 3079J 62 pt 3079J 63 pt 3079J 64 pt 3079J 65 pt 3079J 66 pt 3079K 93 pt
30523 00	30413 00	30413 00				30840 19	30794 26	30794 26			
30524 00	30414 00	30414 00	30614 00	3069B 00	3069B 11	30850 00	30795 00	30795 00			
30525 00	30415 00	30415 00	30615 00	3069B 00	3069B 12 3069B 13 3069B 14 3069B19	30861 00	30797 41	30797 41			
30526 00	30416 00	30416 00				30862 10 30862 20 30862 90	30797 51 30797 53 30797 59	30797 42	30893 00	3079F 22	3079J 61 pt 3079J 62 pt 3079J 63 pt 3079J 64 pt 3079J 65 pt 3079J 66 pt 3079K 99 pt
30534 11	32934 11	32934 11	30616 00	3069B 00	3069B 21	30863 10 30863 90	30797 61 30797 69	30797 44			
30534 13	32934 13	32934 13	30617 00	3069B 00	3069B 29				30894 01	30798 01	3079J 61 pt 3079J 62 pt 3079J 63 pt 3079J 64 pt 3079J 65 pt 3079J 66 pt 3079K 99 pt
30534 15	32934 15	32934 15	30697 77	30697 77	30697 11 30697 78	30864 10 30864 20 30864 30 30864 90	30797 71 30797 73 30797 75 30797 79	30797 45			
30534 17	32934 17	32934 17	3069C 12	35558 72	35557 72						
30535 11	32935 11	32935 11	3069C 30	35558 76	35557 76	30865 10 30865 20 30865 30 30865 40 30865 90	30797 81 30797 83 30797 85 30797 86 30797 89	30797 46			
30535 13	32935 13	32935 13	3069D 20	3069D 20	3069D 17 3069D 19				30894 02	30798 02	3079J 61 pt 3079J 62 pt 3079J 63 pt 3079J 64 pt 3079J 65 pt 3079J 66 pt 3079K 99 pt
30535 15	32935 15	32935 15	3069D 42	3069D 42	3069D 55 3069D 58	30866 10	30797 43	30797 43			
30535 17	32935 17	32935 17				30866 90	30797 47	30797 47			
30535 19	32935 19	32935 19	3069E 20	30310 00	30310 00	30870 12 30870 13	30791 01 30791 02	3079K 99	30894 03	30798 03	3079J 61 pt 3079J 62 pt 3079J 63 pt 3079J 64 pt 3079J 65 pt 3079J 66 pt 3079K 99 pt
30535 21	32935 21	32935 21	30810 10	30792 11	30792 10 pt 30792 20 pt 30792 30 pt 30792 40 pt 30792 50 pt 30792 60 pt 30792 70 pt						
30535 23	32935 23	32935 23				30880 00	3079F 20	3079J 61 pt 3079J 62 pt 3079J 63 pt 3079J 64 pt 3079J 65 pt 3079J 66 pt 3079K 99 pt			
30535 29	32935 29	32935 29									
30536 21	32936 21	32936 21									
30536 22	32936 22	32936 22	30810 20	30792 12	30792 10 pt 30792 20 pt 30792 30 pt 30792 40 pt 30792 50 pt 30792 60 pt 30792 70 pt				30894 04	30798 04	3079J 61 pt 3079J 62 pt 3079J 63 pt 3079J 64 pt 3079J 65 pt 3079J 66 pt 3079K 99 pt
30536 25	32936 25	32936 25									
30536 26	32936 26	32936 26									
30536 30	32936 30	32936 30									
30536 35	32936 35	32936 35	30810 30	30792 13	30792 10 pt 30792 20 pt 30792 30 pt 30792 40 pt 30792 50 pt 30792 60 pt 30792 70 pt				30894 05	30798 05	3079J 61 pt 3079J 62 pt 3079J 63 pt 3079J 64 pt 3079J 65 pt 3079J 66 pt 3079K 99 pt
30537 29	32937 29	32937 29									
30537 39	32937 39	32937 39									
30537 41	32937 41	32937 41	30810 40	30792 14	30792 10 pt 30792 20 pt 30792 30 pt 30792 40 pt 30792 50 pt 30792 60 pt 30792 70 pt						
30537 43	32937 43	32937 43									
30537 49	32937 49	32937 49									
30538 10	32938 10	32938 10									
30538 13	32938 13	32938 13	30810 50	30792 19	30792 10 pt 30792 20 pt 30792 30 pt 30792 40 pt 30792 50 pt 30792 60 pt 30792 70 pt				30894 06	30798 06	3079J 61 pt 3079J 62 pt 3079J 63 pt 3079J 64 pt 3079J 65 pt 3079J 66 pt 3079K 99 pt
30538 15	32938 15	32938 15									
30538 17	32938 17	32938 17									
30538 19	32938 19	32938 19									
30539 70	32939 70	32939 70	30820 10 30820 20 30820 30 30820 40 30820 50 30820 60 30820 70 30820 80 30820 90	30796 01 30796 02 30796 03 30796 04 30796 05 30796 06 30796 07 30796 08 30796 19	3079K 80				30894 07	30798 07	3079J 61 pt 3079J 62 pt 3079J 63 pt 3079J 64 pt 3079J 65 pt 3079J 66 pt 3079K 99 pt
30539 73	32939 73	32939 73									
30539 75	32939 75	32939 75									
						30892 20	3079D 33	3079J 61 pt 3079J 62 pt 3079J 63 pt 3079J 64 pt 3079J 65 pt	30895 01	30799 01	3079J 61 pt

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1987 published	1987 collected	1982 published	1987 published	1987 collected	1982 published	1987 published	1987 collected	1982 published	1987 published	1987 collected	1982 published
30895 01— Con.	30799 01— Con.	3079J 61 pt —Con. 3079J 62 pt 3079J 63 pt 3079J 64 pt 3079J 65 pt 3079J 66 pt	30896 22— Con.	3079A 21— Con.	3079J 61 pt —Con. 3079J 63 pt 3079J 64 pt 3079J 65 pt 3079J 66 pt 3079K 99 pt	30898 05— Con.	3079B 25— Con.	3079J 61 pt —Con. 3079J 65 pt 3079J 66 pt 3079K 94 pt 3079K 99 pt	32927 15	32927 15	32929 11 32929 21
									32927 31	32927 31	32929 31
									32927 33	32927 33	32929 33
30895 02	30799 02	3079J 61 pt 3079J 62 pt 3079J 63 pt 3079J 64 pt 3079J 65 pt 3079J 66 pt	30896 23	3079A 23	3079J 61 pt 3079J 62 pt 3079J 63 pt 3079J 64 pt 3079J 65 pt 3079J 66 pt 3079K 99 pt	30898 06	3079B 26	3079J 61 pt 3079J 62 pt 3079J 63 pt 3079J 64 pt 3079J 65 pt 3079J 66 pt 3079K 94 pt 3079K 99 pt	32927 34	32927 34	32929 34
									32927 36	32927 36	32929 36
									32927 41	32927 41	32929 41
30895 03	30799 03	3079J 61 pt 3079J 62 pt 3079J 63 pt 3079J 64 pt 3079J 65 pt 3079J 66 pt	30896 24	3079A 25	3079J 61 pt 3079J 62 pt 3079J 63 pt 3079J 64 pt 3079J 65 pt 3079J 66 pt 3079K 99 pt	30898 07	3079B 27	3079J 61 pt 3079J 62 pt 3079J 63 pt 3079J 64 pt 3079J 65 pt 3079J 66 pt 3079K 94 pt 3079K 99 pt	32927 77	32927 77	32929 77
									32927 78	32927 78	32929 51 32929 73 32929 75
30896 11	3079A 11	3079J 61 pt 3079J 62 pt 3079J 63 pt 3079J 64 pt 3079J 65 pt 3079J 66 pt 3079K 99 pt	30896 25	3079A 27	3079J 61 pt 3079J 62 pt 3079J 63 pt 3079J 64 pt 3079J 65 pt 3079J 66 pt 3079K 99 pt	30898 08	3079B 28	3079J 61 pt 3079J 62 pt 3079J 63 pt 3079J 64 pt 3079J 65 pt 3079J 66 pt 3079K 94 pt 3179K 99	32927 98	32927 98	32928 13 32929 98
									32961 11	32961 11	32963 11 32965 11
									32961 31	32961 31	32963 31 32965 31
30896 12	3079A 12	3079J 61 pt 3079J 62 pt 3079J 63 pt 3079J 64 pt 3079J 65 pt 3079J 66 pt 3079K 99 pt	30896 26	3079A 28	3079J 61 pt 3079J 62 pt 3079J 63 pt 3079J 64 pt 3079J 65 pt 3079J 66 pt 3079K 99 pt	30898 09	3079B 29	3079J 61 pt 3079J 62 pt 3079J 63 pt 3079J 64 pt 3079J 65 pt 3079J 66 pt 3079K 94 pt 3179K 99	32961 35	32961 35	32963 35 32965 35
									32961 38	32961 38	32963 38 32965 38
30896 13	3079A 13	3079J 61 pt 3079J 62 pt 3079J 63 pt 3079J 64 pt 3079J 65 pt 3079J 66 pt 3079K 99 pt	30896 27	2499A 94 3079A 29	2499A 94 3079J 61 pt 3079J 62 pt 3079J 63 pt 3079J 64 pt 3079J 65 pt 3079J 66 pt 3079K 99 pt	30899 00	3079F 31	3079K 88	32961 51	32961 51	32963 51 32965 51
									32961 61	32961 61	32963 61 32965 61
30896 14	3079A 14	3079J 61 pt 3079J 62 pt 3079J 63 pt 3079J 64 pt 3079J 65 pt 3079J 66 pt 3079K 99 pt	30897 01	3079F 25	3079J 61 pt 3079J 62 pt 3079J 63 pt 3079J 64 pt 3079J 65 pt 3079J 66 pt 3079K 95 pt	3089A 11	3079F 41	3079K 93 pt 3079K 94 pt 3079K 95 pt 3079K 99 pt	32961 98	32961 98	32963 98 32965 98
									32962 31	32962 31	32964 31 32966 31
30896 15	3079A 15	3079J 61 pt 3079J 62 pt 3079J 63 pt 3079J 64 pt 3079J 65 pt 3079J 66 pt 3079K 99 pt	30897 09	3079F 27	3079J 61 pt 3079J 62 pt 3079J 63 pt 3079J 64 pt 3079J 65 pt 3079J 66 pt 3079K 95 pt	3089A 12	3079F 43	3079K 93 pt 3079K 94 pt 3079K 95 pt 3079K 99 pt	32962 34	32962 34	32964 34 32966 34
									32962 36	32962 36	32964 36 32966 36
30896 16	3079A 16	3079J 61 pt 3079J 62 pt 3079J 63 pt 3079J 64 pt 3079J 65 pt 3079J 66 pt 3079K 99 pt	30898 01	3079B 21	3079J 61 pt 3079J 62 pt 3079J 63 pt 3079J 64 pt 3079J 65 pt 3079J 66 pt 3079K 99 pt	3089A 14	3079F 47	3079K 93 pt 3079K 94 pt 3079K 95 pt 3079K 99 pt	32962 45	32962 45	32964 45 32966 45
									32962 51	32962 51	32964 51 32966 51
30896 17	3079A 17	3079J 61 pt 3079J 62 pt 3079J 63 pt 3079J 64 pt 3079J 65 pt 3079J 66 pt 3079K 99 pt	30898 02	3079B 22	3079J 61 pt 3079J 62 pt 3079J 63 pt 3079J 64 pt 3079J 65 pt 3079J 66 pt 3079K 99 pt	32295 00	32295 00	32291 00 pt	32962 61	32962 61	32964 61 32966 61
									32962 83	32962 83	32964 83 32966 83
30896 18	3079A 18	3079J 61 pt 3079J 62 pt 3079J 63 pt 3079J 64 pt 3079J 65 pt 3079J 66 pt 3079K 99 pt	30898 03	3079B 23	3079J 61 pt 3079J 62 pt 3079J 63 pt 3079J 64 pt 3079J 65 pt 3079J 66 pt 3079K 99 pt	32296 00	32296 00	32292 00 pt	32962 98	32962 98	32964 98 32966 98
									32297 00	32297 00	32294 00 pt
30896 19	3079A 19	3079J 61 pt 3079J 62 pt 3079J 63 pt 3079J 64 pt 3079J 65 pt 3079J 66 pt 3079K 99 pt	30898 04	3079B 24	3079J 61 pt 3079J 62 pt 3079J 63 pt 3079J 64 pt 3079J 65 pt 3079J 66 pt 3079K 99 pt	32298 00	32298 00	32291 00 pt 32292 00 pt 32294 00 pt	32962 00	32962 00	32964 00
									32311 00 32312 00	32311 00 32312 00	32317 00
30896 21	3079A 20	3079J 61 pt 3079J 62 pt 3079J 63 pt 3079J 64 pt 3079J 65 pt 3079J 66 pt 3079K 99 pt	30898 05	3079B 25	3079J 61 pt 3079J 62 pt 3079J 63 pt 3079J 64 pt 3079J 65 pt 3079J 66 pt 3079K 99 pt	32620 15	32620 15	32620 14 32620 52 pt	32962 15	32962 15	32964 15 32966 15
									32962 19	32962 19	32964 19 32966 19
30896 22	3079A 21	3079J 61 pt 3079J 62 pt				32630 15	32630 15	32630 14 32630 52 pt	33121 98	33121 98	33121 79 33121 85 33121 98
						32630 19	32630 19	32630 18 32630 52 pt	3312A 11 3312A 23 3312A 25 3312A 27	3312A 11 3312A 23 3312A 25 3312A 27	3312A 00
						32752 11	32752 11	32752 00	3312B 61 3312B 63 3312B 65 3312B 67	3312B 61 3312B 63 3312B 65 3312B 67	3312B 00
						32917 23	32917 23	32917 22 32917 24	33151 22 33151 23	33151 22 33151 23	33151 21
						32917 40	32917 40	32917 26 32917 28 32917 39	33152 01	33152 01	33152 11 pt 33152 13 pt 33152 17 pt 33152 19 pt 34967 11 pt 34967 13 pt 34967 17 pt 34967 19 pt
						32927 14	32927 14	32928 15 32928 17	33152 03	33152 03	33152 11 pt 33152 13 pt 33152 17 pt 33152 19 pt 34967 11 pt 34967 17 pt

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1987 published	1987 collected	1982 published	1987 published	1987 collected	1982 published	1987 published	1987 collected	1982 published	1987 published	1987 collected	1982 published
33152 03— Con.	33152 03— Con.	33152 11 pt —Con. 34967 19 pt	33157 42— Con.	33157 42— Con.	33157 31 pt —Con. 33157 71 pt	33561 66— Con. 33562 78 33563 91 33569 91	33561 66— Con. 33562 78 33563 91 33569 91	33569 92— Con.	34236 21	34236 21	34233 21
									34236 31	34236 31	34233 31
33152 05	33152 05	33152 11 pt 33152 13 pt 33152 17 pt 33152 19 pt 34967 13 pt 34967 17 pt 34967 19 pt	33157 43	33157 43	33157 31 pt 33157 61 pt 33157 71 pt	33630 00	33611 00	33611 00	34236 41	34236 41	34233 41
									34236 81	34236 81	34238 81
			33159 44 33159 45 33159 48	33159 44 33159 45 33159 48	33159 49	33640 11	33620 42	33620 42	34236 99	34236 99	34233 99
						33640 21	33691 51	33691 51	34292 12 34298 99	34292 12 34298 99	34298 98
33152 07	33152 07	33152 11 pt 33152 13 pt 33152 17 pt 34967 11 pt 34967 13 pt 34967 17 pt 34967 19 pt	33159 99	33159 99	33159 77 33159 98	33640 31	33692 31	33692 31	34320 01 34320 03	34320 01 34320 03	34320 04
			33211 21	33211 21	33211 22 pt 33211 24 pt 33211 27 pt 33211 30 pt	33640 41	33693 71	33693 71	34320 05 34320 07	34320 05 34320 07	34320 06
						33640 51	33693 91	33693 91	34320 09 34320 11	34320 09 34320 11	34320 08
			33211 23	33211 23	33211 22 pt 33211 24 pt 33211 27 pt 33211 30 pt	33650 31	33612 31	33612 31	34320 14 34320 25 34320 35	34320 14 34320 25 34320 35	34320 98
33152 09	33152 09	33152 11 pt 33152 13 pt 33152 17 pt 33152 19 pt 34967 11 pt 34967 13 pt 34967 17 pt 34967 19 pt	33211 25	33211 25	33211 33 pt 33211 36 pt 33211 39 pt 33211 42 pt	33650 51	33612 51	33612 51	34320 47 34320 48	34320 47 34320 48	34320 79
						33650 61	33612 61	33612 61	34320 67 34320 69	34320 67 34320 69	34320 65
			33650 73	33612 73	33612 73	34320 71 34320 74 34320 75	34320 71 34320 74 34320 75	34320 98			
			33211 26	33211 26	33211 33 pt 33211 36 pt 33211 39 pt 33211 42 pt	33660 20	33620 20	33620 20	34320 84 34320 86	34320 84 34320 86	34320 56
33152 10	33152 10	33152 11 pt 33152 13 pt 33152 17 pt 33152 19 pt 34967 11 pt 34967 13 pt 34967 17 pt 34967 19 pt	33217 31	33217 31	33217 32 pt 33217 34 pt 33217 37 pt 33217 40 pt	33660 21	33620 21	33620 21	34320 87	34320 87	34320 98 pt
						33660 22	33620 22	33620 22	34320 90 34320 91	34320 90 34320 91	34320 40
			33660 23	33620 23	33620 23	34320 92 34320 93	34320 92 34320 93	34320 42			
			33660 24	33620 24	33620 24	34320 94 34320 95	34320 94 34320 95	34320 43			
33152 12	33152 12	33152 11 pt 33152 13 pt 33152 17 pt 33152 19 pt 34967 11 pt 34967 13 pt 34967 17 pt 34967 19 pt	33217 33	33217 33	33217 32 pt 33217 34 pt 33217 37 pt 33217 40 pt	33660 25	33620 25	33620 25	34320 96 34320 97	34320 96 34320 97	34320 44
						33660 31	33620 31	33620 31	34320 99	34320 99	34320 98 pt
			33660 41	33620 52	33620 61 pt	34320 99 34432 44	34320 99 34432 44	34432 45			
			33660 51	33620 51	33620 51	34320 99 34432 46 34432 48	34320 99 34432 46 34432 48	34432 47			
33152 14	33152 14	33152 11 pt 33152 13 pt 33152 17 pt 33152 19 pt 34967 11 pt 34967 13 pt 34967 17 pt 34967 19 pt	33217 35	33217 35	33217 43 pt 33217 46 pt 33217 49 pt 33217 52 pt	33660 41	33620 52	33620 61 pt	34432 52 34432 54 34432 56 34432 98	34432 52 34432 54 34432 56 34432 98	34432 99
						33660 61	33620 61 pt	33620 61 pt	34433 13	34433 13	34433 12 34433 14 34433 48 pt
			33660 72	33620 72	33620 72	34433 17	34433 17	34433 16 34433 18 34433 48 pt			
			33690 11	33691 61	33691 61	34433 22	34433 22	34433 21 34433 23 34433 48 pt			
33152 16	33152 16	33152 11 pt 33152 13 pt 33152 17 pt 33152 19 pt 34967 11 pt 34967 13 pt 34967 17 pt 34967 19 pt	33252 11	33252 11	33252 12 33252 13	33690 15	33692 11	33692 11	34433 32	34433 32	34433 31 34433 33 34433 48 pt
						33690 21	33692 33	33692 33	34433 38	34433 38	34433 45
			33690 25	33692 41	33692 41	34433 39 34433 49 34433 50	34433 39 34433 49 34433 50	34433 48 pt			
			33690 91 33690 98	33693 94 33693 99	33693 99	34433 41	34433 41	34433 40			
33152 22	33152 22	33152 33 pt 34967 23 pt	33392 39	33334 39	33334 38 pt	33991 91 33991 98	33991 91 33991 98	33991 99	34433 42	34433 42	34433 41 34433 43 34433 44
			33392 41	33334 41	33334 41	34234 11	34234 11	34232 31	34433 46 34433 48	34433 46 34433 48	34433 47
33152 23	33152 23	33152 23 34967 19 pt	33392 43	33334 43	33334 45 pt	34234 22	34234 22	34232 83	34433 49	34433 49	34433 48 pt
33152 25	33152 25	33152 25 34967 21	33392 49	33334 49	33334 48 pt	34234 33	34234 33	34232 85	34433 51	34433 51	34433 50
						34234 44 34234 98	34234 44 34234 98	34232 99	34433 52 34433 54 34433 56 34433 98	34433 52 34433 54 34433 56 34433 98	34433 99
33152 30	33152 30	33152 33 pt 34967 23 pt	33392 51	33334 51	33334 35 pt 33334 38 pt 33334 45 pt 33334 48 pt	34235 11	34235 11	34232 53	34433 13	34433 13	34433 12 34433 14 34433 48 pt
						34235 31	34235 31 35533 81	34232 99 pt 35531 85 pt 35532 81 pt	34433 17	34433 17	34433 16 34433 18 34433 48 pt
33156 15 33156 17	33156 15 33156 17	33156 13	33392 55	33334 55	33334 55	34235 12	34235 12	34232 54	34433 21	34433 21	34433 20 34433 22 34433 23 34433 24
33156 22 33156 24	33156 22 33156 24	33156 21	33398 01	33321 00	33321 00	34235 21	34235 21	34232 56	34433 25	34433 25	34433 24 34433 26 34433 27 34433 28
						34235 22	34235 22	34232 58	34433 29	34433 29	34433 28 34433 30 34433 31 34433 32 34433 33 34433 34 34433 35 34433 36 34433 37 34433 38 34433 39 34433 40 34433 41 34433 42 34433 43 34433 44 34433 45 34433 46 34433 47 34433 48 34433 49 34433 50 34433 51 34433 52 34433 53 34433 54 34433 55 34433 56 34433 57 34433 58 34433 59 34433 60 34433 61 34433 62 34433 63 34433 64 34433 65 34433 66 34433 67 34433 68 34433 69 34433 70 34433 71 34433 72 34433 73 34433 74 34433 75 34433 76 34433 77 34433 78 34433 79 34433 80 34433 81 34433 82 34433 83 34433 84 34433 85 34433 86 34433 87 34433 88 34433 89 34433 90 34433 91 34433 92 34433 93 34433 94 34433 95 34433 96 34433 97 34433 98 34433 99 34434 00 34434 01 34434 02 34434 03 34434 04 34434 05 34434 06 34434 07 34434 08 34434 09 34434 10 34434 11 34434 12 34434 13 34434 14 34434 15 34434 16 34434 17 34434 18 34434 19 34434 20 34434 21 34434 22 34434 23 34434 24 34434 25 34434 26 34434 27 34434 28 34434 29 34434 30 34434 31 34434 32 34434 33 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1987 published	1987 collected	1982 published	1987 published	1987 collected	1982 published	1987 published	1987 collected	1982 published	1987 published	1987 collected	1982 published
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						34926 00	3494G 00	3494G 00			
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1987 published	1987 collected	1982 published	1987 published	1987 collected	1982 published	1987 published	1987 collected	1982 published	1987 published	1987 collected	1982 published
35112 74	35112 74	35112 75 pt	3531E 00	3531E 00	35314 00 pt	35337 22 35337 23	35337 22 35337 23	35331 41	35364 03	35364 03	35362 09 35362 15 pt
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3531C 00	3531C 00	35317 10 35317 20 35317 30	35329 34	35329 34	35329 31 pt 35329 35 pt	3533A 78	3533A 78	35335 78	35374 17	35364 57	35362 57
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35455 11	35455 11	35452 11	35482 13	36232 55	36232 55	35533 33	35533 33	35531 75 pt	35558 02	35558 02	35557 01
35455 13	35455 13	35452 13	35482 14	36232 58	36232 58	35533 35 35533 37	35533 35 35533 37	35531 98 pt	35558 09	35558 09	35557 69
35455 15	35455 15	35452 15	35482 15	36232 62	36232 61 36232 65	35533 39	35533 39	35531 17 35531 73 pt 35531 75 pt 35531 98 pt	35558 83	35558 83	35557 83
35455 17	35455 17	35452 17	35482 16	36232 66	36232 64 pt 36232 68 pt	35534 01 35534 02 35534 03	35534 01 35534 02 35534 03	35532 21	35558 85	35558 85	35557 85
35455 21	35455 21	35452 21	35482 19	36232 66	36232 64 pt 36232 68 pt	35534 04 35534 05 35534 06 35534 07 35534 08 35534 09	35534 04 35534 05 35534 06 35534 07 35534 08 35534 09	35532 98	35558 87	35558 87	35557 87
35455 61	35455 61	35452 61	35483 05	36233 13	36233 13	35534 11	35534 11	35532 81 pt	35558 89	35558 89	35557 89
35455 65	35455 65	35452 65	35483 06	36233 23	36233 23	35543 01	35543 01	35541 11 35542 73 pt	35561 02	35511 02	35511 41 pt 35511 99 pt
35455 71	35455 71	35452 71	35483 07	36233 31	36233 31	35543 02	35543 02	35541 21 35541 27 35542 73 pt	35561 05	35511 05	35511 73
35455 81 35455 83	35455 81 35455 83	35452 99 pt	35483 08	36233 52	36233 52				35561 06	35511 06	35511 83
35455 91 35455 92	35455 91 35455 92	35452 92	35483 09	36233 61	36233 61						
35455 93	35455 93	35452 99 pt	35483 11	36233 71	36233 71						
35455 94	35455 94	35452 94	35483 19	36233 81	36233 81						
35455 95	35455 95	35452 95	35484 01	35496 01	35496 01						
35455 96 35455 97 35455 98	35455 96 35455 97 35455 98	35452 99 pt	35484 02	35496 05	35496 05						
35462 42 35462 44	35462 42 35462 44	35462 43	35484 03	35496 09	35496 09						
35462 47	35462 47	35462 45 35462 49	35484 04	35496 15	35496 15						
			35484 05	35496 17	35496 17						

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1987 published	1987 collected	1982 published	1987 published	1987 collected	1982 published	1987 published	1987 collected	1982 published	1987 published	1987 collected	1982 published
35561 07	35511 07	35511 91	35593 01	35593 11	35593 11	35599 13	35599 13	35595 41 pt 35595 98 pt	35616 00	35616 00	3561C 00
35561 08	35511 08	35511 99 pt	35593 03	35593 31	35593 31	35599 15	35599 15	35595 41 pt 35595 98 pt	35645 46 35645 47	35645 46 35645 47	35645 49
35561 09	35511 09	35511 41 pt	35593 05	35593 32	35593 32				35646 10 35646 20	35646 10 35646 20	35646 00
35561 11 35561 19 35561 21	35511 11 35511 19 35511 21	35511 99 pt	35593 07	35593 34	35593 34	35599 17	35599 17	35595 41 pt 35595 98 pt	35651 01	35514 15 35691 15	35514 15 35691 15
35562 11	35512 11	35512 11	35593 11	35593 52	35593 52	35599 19	35599 19	35595 41 pt 35595 98 pt	35651 02	35514 22 35691 22	35514 22 35691 22
35562 21	35512 21	35512 21	35593 13	35593 13	35593 53 35593 54	35599 22	35599 22	35595 41 pt 35595 98 pt	35651 03	35514 26 35691 26	35514 26 35691 26
35562 31	35512 31	35512 31	35593 15	35593 61	35593 61	35599 25	35599 25	35595 41 pt 35595 98 pt	35651 04	35514 29 35691 29	35514 29 35691 29
35562 41	35512 41	35512 41	35593 17	35593 71	35593 71				35651 05	35514 30 35691 30	35514 30 35691 30
35562 51	35512 51	35512 51	35593 19	35593 72	35593 72	35599 27 35599 29	35599 27 35599 29	35595 41 pt	35651 06	35514 32 35691 32	35514 32 35691 32
35562 65	35512 65	35512 61 35512 92 pt	35593 21 35593 23 35593 25	35593 21 35593 23 35593 25	35593 79	35599 31 35599 33	35599 31 35599 33	35595 45	35651 07	35514 33 35691 33	35514 33 35691 33
35562 71	35512 71	35512 71	35593 27 35593 28 35593 29	35593 27 35593 28 35593 29	35593 81	35599 35 35599 37	35599 35 35599 37	35595 49	35651 08	35514 35 35691 35	35514 35 35691 35
35562 75	35512 75	35512 75	35594 01	35594 11	35594 11	35599 39 35599 41	35599 39 35599 41	35595 43	35651 09	35514 41 35691 41	35514 41 35691 41
35562 85	35512 85	35512 92 pt	35594 03	35594 31	35594 31	35599 43 35599 45	35599 43 35599 45	35595 52	35651 11	35514 52 35691 52	35514 52 35691 52
35562 91	35512 91	35512 87 35512 92 pt	35594 05	35594 51	35594 51	35599 47	35599 47	35595 85 pt	35651 12	35514 53 35691 53	35514 53 35691 53
35563 01	35513 01	35513 59 pt	35594 07	35594 71	35594 71				35651 13	35514 54 35691 54	35514 54 35691 54
35563 02	35513 02	35513 39	35594 09 35594 13 35594 15	35594 09 35594 13 35594 15	35594 79	35599 49 35599 51	35599 49 35599 51	35595 98 pt	35651 14	35514 55 35691 55	35514 55 35691 55
35563 03 35563 04	35513 03 35513 04	35513 59 pt	35594 17 35594 19 35594 21	35594 17 35594 19 35594 21	35594 81	35599 53 35599 55	35599 53 35599 55	35595 73	35651 15	35514 63 35691 63	35514 63 35691 63
35563 05	35513 05	35513 23 pt 35513 59 pt	35596 01 35596 03 35596 05 35596 07 35596 09 35596 11 35596 13 35596 15 35596 17 35596 19	35596 01 35596 03 35596 05 35596 07 35596 09 35596 11 35596 13 35596 15 35596 17 35596 19	35596 95	35599 61 35599 63	35599 61 35599 63	35595 96	35651 16	35514 71 35691 71	35514 71 35691 71
35563 06	35513 06	35513 52 35513 59 pt	35599 65	35599 65	35599 82 pt	35599 67	35599 67	35595 86 pt	35651 17	35514 81 35691 81	35514 81 35691 81
35563 07	35513 07	35513 59 pt	35599 69	35599 69	35595 83 pt 35595 84 pt	35599 71	35599 71	35595 82 pt 35595 83 pt 35595 84 pt 35595 85 pt 35595 86 pt	35651 18	35514 82 35691 82	35514 82 35691 82
35563 08	35513 08	35513 49	35599 73 35599 75	35599 73 35599 75	35595 87	35599 77 35599 79	35599 77 35599 79	35595 94	35651 19	35514 83 35691 83	35514 83 35691 83
35563 09	35513 09	35513 59 pt	35599 80 35599 81	35599 80 35599 81	35595 98 pt	35599 82	35599 82	35595 62 pt	35651 21	35514 84 35691 84	35514 84 35691 84 pt
35563 11	35513 11	35513 13	35599 83	35599 83	35595 98 pt	35599 85	35599 85	35595 62 pt 35595 98 pt	35651 22	35514 85 35691 85	35513 67 35691 84 pt
35563 12	35513 12	35513 23 pt 35513 59 pt	35599 86 35599 87	35599 86 35599 87	35595 98 pt	35599 88	35599 88	35595 98 pt	35652 00	35514 91 35691 91	35513 83 pt 35514 91 35691 91
35563 14	35513 14	35513 59 pt	35599 89	35599 89	35595 98 pt	35599 90	35599 90	35595 98 pt	35674 01	35674 01	35674 11 pt
35563 15	35513 15	35513 29 35513 59 pt	35599 92 35599 93 35599 94 35599 95 35599 96 35599 97	35599 92 35599 93 35599 94 35599 95 35599 96 35599 97	35595 11	35599 92 35599 93 35599 94 35599 95 35599 96 35599 97	35599 92 35599 93 35599 94 35599 95 35599 96 35599 97	35595 98 pt	35674 02	35674 02	35674 17
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35591 01 35591 03 35591 05	35591 01 35591 03 35591 05	35591 00 pt	35597 01	35494 01	35494 01	35599 88	36362 74	36362 74	35675 01	35675 01	35675 51
35591 07	35591 07 35698 33	35591 00 pt 35699 97 pt	35597 02	35494 03	35494 03	35599 89	36362 75	36362 75	35675 02 35675 03	35675 02 35675 03	35675 59
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35591 13 35698 34	35591 13 35698 34	35591 00 pt 35699 97 pt	35597 04	35494 07	35494 07	35599 92	35599 92	35595 98 pt	35676 00	35676 00	35672 00 pt
35591 15	35591 15	35591 00 pt	35597 05	35494 09	35494 09	35599 93	35599 93	35595 98 pt	35676 01	35676 01	35672 11
35592 01	35592 21	35592 21	35597 09	35494 11	35494 17 35494 19 pt	35599 94	35599 94	35595 98 pt			
35592 03	35592 33	35592 33	35597 11	35494 13	35494 19 pt	35599 95	35599 95	35595 98 pt			
35592 05	35592 35	35592 35	35599 01	35599 01	35595 11	35599 96	35599 96	35595 98 pt			
35592 07	35592 54	35592 54	35599 03	35599 03	35595 21	35599 97	35599 97	35595 98 pt			
35592 09 35592 11	35592 09 35592 11	35592 98 pt	35599 05	35599 05	35595 32	35599 99	35599 99	35595 88 35595 98 pt			
35592 15	35592 15	35592 41 35592 42 35592 98 pt	35599 07	35599 07							
35592 19	35592 97	35592 97									

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35676 04	35676 04	35672 00 pt	35771 00				35732 30 35732 61	35732 00 pt	35893 01 35893 02	35893 01 35893 02	35893 11
35676 05	35676 05	35672 41 pt		35772 00	35733 30	35734 30 pt 35735 51 pt 35734 30 pt 35735 51 pt			35893 08 35893 09	35893 08 35893 09	35893 98
35676 06	35676 06	35672 00 pt	35781 00				35733 60	35743 00	35921 01	35921 01	35921 11
35676 17 35676 19	35676 17 35676 19	35672 41 pt		35921 03	35921 03	35921 71					
35681 11 35681 13	35681 11 35681 13	35681 15	35782 00				35744 00	35744 00	35921 05	35921 05	35921 72
35683 36 35683 93 35683 95	35683 36 35683 93 35683 95	35683 99 pt		35783 00	35745 00	35745 10 35745 31					
35683 98	35683 98	35683 91 35683 99 pt	3579A 00				3579A 00	3579A 20 3579A 40 3579A 41 3579A 44 3579A 50 3579A 55	35922 02	35922 02	35922 23
35692 00	35692 00	35694 00 35695 00 35696 00		35820 35 35820 36	35820 35 35820 36	35820 24					
35693 04	35693 04	35693 01 pt 35693 02 pt 35693 03 pt	35856 00				35856 00	35856 11 35856 30	35922 04	35922 04	35922 53
				35693 05	35693 05	35693 01 pt 35693 02 pt 35693 03 pt					
35693 06	35693 06	35693 01 pt 35693 02 pt 35693 03 pt	35922 06				35922 06	35922 57			
				35697 00	35697 00	35699 97 pt			35922 09	35922 09	35922 59
35698 01 35698 02	35698 01 35698 02	35699 31	35923 01				35923 01	35923 61			
				35698 03 35698 04	35698 03 35698 04	35699 32			35923 02	35923 02	35923 63
35698 05 35698 06	35698 05 35698 06	35699 33	35931 00				35991 00	35996 00 35997 00			
				35698 07 35698 08	35698 07 35698 08	35699 35			35932 00	35998 00	35998 00
35698 11 35698 12	35698 11 35698 12	35699 36	36127 11 36127 31 36127 78				36127 11 36127 31 36127 78	36127 00			
				35698 13 35698 14	35698 13 35698 14	35699 41			36249 94 36249 96	36249 94 36249 96	36249 98
35698 15 35698 16	35698 15 35698 16	35699 43	36251 00				36138 10 36794 00	36138 00 pt 36794 00			
				35698 17 35698 18	35698 17 35698 18	35699 45			36252 00	36221 00	36221 00
35698 21 35698 22	35698 21 35698 22	35699 51	36254 00				36138 20 36223 00	36138 00 pt 36223 00			
				35698 23 35698 24	35698 23 35698 24	35699 61			36291 01	36291 11	36291 11
35698 25 35698 26	35698 25 35698 26	35699 71	36291 03				36291 31	36291 31			
				35698 27 35698 28	35698 27 35698 28	35699 73			36291 05	36291 05	36291 35 36291 98 pt
35698 31 35698 32	35698 31 35698 32	35699 74	36291 09				36291 09	36291 98 pt			
				35698 35 35698 36 35698 48 35698 49	35698 35 35698 36 35698 48 35698 49	35699 97 pt			36293 01	36293 01	36293 13 36293 15
35711 00	35731 00 36629 43	35731 00 36629 00 pt	36293 02				36293 31	36293 31			
				35712 00	35733 05	35734 20 35735 41			36293 03 36293 04 36293 05 36293 09	36293 03 36293 04 36293 05 36293 09	36293 99
35721 00	35732 10	35732 00 pt	36311 10 36311 20				36311 10 36311 20	36311 00			
				35722 00	35733 10	35734 30 pt 35735 51 pt			36313 10 36313 20	36313 10 36313 20	36313 00
35892 85 35892 87 35892 88	35892 85 35892 87 35892 88	35892 86	36314 10 36314 20				36314 10 36314 20	36314 00			
				35892 91	35892 91	35892 93 pt			36330 10	36330 10	36331 00 36333 11 36333 15 36333 71
35962 17 35962 19	35762 17 35762 19	35760 37 pt	36330 20				36330 20	36333 95			
				35963 01	35763 01	35760 61			36349 20	36349 20	36349 13 36349 18 36349 88 36349 89

PUBLICATION PROGRAM

1987 CENSUS OF MANUFACTURES

Publications of the 1987 Census of Manufactures, containing preliminary and final data on manufacturing establishments in the United States, are described below. Publications order forms for the specific reports may be obtained from any Department of Commerce district office or from Data User Services Division, Customer Services (Publications), Bureau of the Census, Washington, DC 20233.

Preliminary Reports

Industry series—83 reports (MC87-I-20A(P) to -39D(P))

Preliminary industry data are issued in 83 separate reports covering 459 industries. Preliminary summary data for the U.S. and States are released in one report.

Final Reports

Industry series—83 reports (MC87-1-20A to -39D)

Each of the 83 reports provides information for a group of related industries ("dairy products" includes industries for butter, cheese, milk, etc.). Final figures for the United States are shown for each of the 459 manufacturing industries on quantity and value of products shipped and materials consumed, cost of fuels and electric energy, capital expenditures, assets, rents, inventories, employment, payroll, payroll supplements, hours worked, value added by manufacture, number of establishments, and number of companies. Comparative statistics for earlier years are provided where available.

For each industry, data on value of shipments, value added by manufacture, capital expenditures, employment, and payroll are shown by employment-size class of establishment, State, and degree of primary product specialization.

Geographic area series—51 reports (MC87-A-1 to -51)

A separate report is being published for each State and the District of Columbia. Each report presents data for industry groups and industries on value of shipments, cost of materials, value added by manufacture, employment, payroll, hours worked, new capital expenditures, and number of manufacturing establishments for the State, MSA's, counties, and selected places. Comparative statistics for earlier census years are shown for the State and large MSA's. Manufacturing totals are presented for each county and for places with significant manufacturing activity. Detailed statistics (including inventories, assets, rents, and energy costs) are presented only in statewide totals.

Subject series—7 reports (MC87-S-1 to -7)

Each of the seven reports contains detailed statistics for an individual subject, such as concentration ratios in manufacturing, type of organization, water use in manufacturing, textile machinery in place, distribution of sales by class of customer, manufacturers' shipments to the Federal Government, and a general national-level summary.

Reference series—1 report (MC87-R-1)

The Numerical List of Manufactured and Mineral Products includes a description of the principal products and services published in the 1987 Censuses of Manufactures and Mineral Industries.

Location of Manufacturing Plants—1 report (MC87-LM)

This report includes data for number of establishments by four-digit SIC industry and by employment-size class for counties, incorporated places of 2,500 inhabitants or more, and zip codes for each State. (This report is available only on magnetic tape and CD-ROM.)

Analytical Reports—3 reports (AR87-1 to -3)

Exports From Manufacturing Establishments (AR87-1)

This report presents data on exports by two- and three-digit SIC industry groups for the United States and States. Information is presented on value of direct report shipments and estimates of the employment required to manufacture these products. Included are estimates of employment in manufacturing and nonmanufacturing establishments that supply parts, materials, and services for production of manufactured exports.

Selected Characteristics of Manufacturing Establishments That Export (AR87-2)

This report presents data on the number of manufacturing companies and establishments that export by major group, State, employment size, and ratios of exports to shipments.

Indexes of Production (AR87-3)

The indexes presented in this report are designed to measure the change in physical output of each manufacturing and mineral industry between 1982 and 1987.

MICROFICHE

Every final published report in the 1987 Census of Manufactures will be available on microfiche.

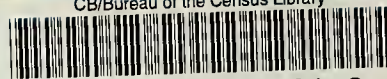
PUBLIC-USE COMPUTER TAPES AND COMPACT DISCS

Data from the final industry series, geographic area series, and the Location of Manufacturing Plants report will be available on public-use computer tapes and compact discs-read only memory (CD-ROM). These tapes will provide the same information found in the final reports. Computerized data products are available for users who wish to summarize, rearrange, or process large amounts of data. These products, with corresponding technical documentation, are sold by Data User Services Division, Customer Services (Tapes), Bureau of the Census, Washington, DC 20233.

OTHER ECONOMIC CENSUSES REPORTS

Data on retail trade, wholesale trade, service industries, construction industries, mineral industries, transportation, enterprise statistics, minority-owned businesses, and women-owned businesses also are available from the 1987 Economic Censuses. A separate series of reports covers the censuses of outlying areas—Puerto Rico, Virgin Islands of the United States, Guam, and the Northern Mariana Islands. Separate announcements describing these reports are available free of charge from Data User Services Division, Customer Services (Publications), Bureau of the Census, Washington, DC 20233.

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